The importance of domestic equity pension funds on stock market.

Alda, M., Marco, I.
University of Zaragoza

Abstract

This study examines for the first time the true impact of domestic pension funds investing in equities on the stock market development from a comprehensive perspective. Specifically, we analyse the influence of three pension fund variables (the portions of domestic equity pension funds over total pension funds assets and GDP, and the pension fund return) on market size, liquidity, activity, growth, return and volatility in eight European stock markets, both in the short- and long-term. Our results show higher influence on the short-term than in the long-term. Pension funds impact positively on the short- and long-run market size, return and stability. Nonetheless, they only encourage short-term liquidity and activity, evidencing less frequent asset reallocation, consistent with the long-term nature of these instruments.

Keywords: development; liquidity; pension funds; stock market; volatility.

1. Introduction.

Over the last decade, many western countries have reformed their public pension systems to face the ageing population effects and the increasing doubts about the future viability of pay-as-you-go public pension systems. Many of these countries have applied short-term reforms, rather than structural, which may be insufficient whether the demographic trend does not change. In this scenario, along with the current economic condition, several governments and global institutions have emphasized the need of saving for retirement. Specifically, several countries have encouraged the investment in pension funds through diverse measures, primarily tax exemptions. Furthermore, these measures attempt to help domestic financial markets because, given the long-term nature of pension fund assets, higher pension savings will produce enduring economic and financial stimuli.

Pension funds are one of the most important investment vehicles for retirement, with a global investment exceeding €21 trillion in 2014 (INVERCO, 2015). The pension fund development has increased the competition among alternative products, and concerned citizens about retirement are allocating a smaller portion of their income to other investments (Apilado, 1972). Pension fund investors benefit from collective investment, professional management and the opportunity to invest in a wide range of instruments and markets. Zandberg and Spierdijk (2013) indicate that pension funds invest a significant amount of their assets abroad. The OECD (2015a) reports that OECD and non-OECD countries tend to increase their pension fund allocation to foreign investments over the last decade. Nonetheless, this change in investor behaviour might be seen as a threat to the measures applied by governments and, thus, to domestic stock markets.

Although several authors corroborate the positive impact of pension funds on stock market development (Davis, 1995; Merton and Bodie, 1995; Davis and Steil, 2001; Meng and Pfau, 2010), these studies examine the influence of pension funds in stock markets without taking into account that not all pension fund assets are invested in stock markets or domestic stocks. Whether pension fund savings increase and asset allocation is made in other countries, the purpose of improving domestic markets through pension funds will be diluted.

In order to overcome the drawback of prior works, our analysis contributes to financial literature in isolating for the first time, as far as we are aware, the real effect of domestic equity pension funds on country-specific stock markets. To accomplish this task we exclude, unlike prior works, pension funds investing in other assets (bonds...) and markets.

We expect some discrepancies with regard to prior works because examining domestic equity pension funds separately reduces the sample size and, perhaps, the strength of the

analysis. Nonetheless, we hypothesize that domestic equity pension funds influence positively on domestic stock markets because higher pension fund investment in domestic equities is due to an investment increase on domestic stocks, so prior evidence would still hold. Indeed, we are excluding the noise produced by the pension fund assets invested in other assets and markets.

On the other hand, we first study this topic from a comprehensive perspective and analyze the pension fund influence on several market variables, taking into account that pension funds may have dissimilar market impacts. Specifically, we analyze the short- and long-term influence of domestic equity pension funds on market size, liquidity, activity, growth, return and volatility, considering three pension fund measures: the portion of domestic equity pension fund assets over the total pension funds, the portion of domestic equity pension fund assets over GDP, and the pension fund return. Prior works provide partial analyses and only consider specific market features, such as market capitalization (Walker and Lefort, 2002; Catalan et al., 2000; Meng and Pfau, 2010; Hu, 2012), liquidity (Catalan et al., 2000; Meng and Pfau, 2010; Hu, 2012), activity (Hu, 2012) or market volatility (Thomas et al., 2014).

Studying a sample of 8 European countries from 1988 to 2013, we find bidirectional causality between pension funds and stock market; that is, stock markets provide supportive environment for pension funds, and domestic equity pension funds also promote stock market development. Taking into account this causality in the study of the relationship between pension funds and stock markets, our results show different short- and long-term results. Unlike other studies, we find higher influence of pension funds on the stock market in the short-term. Specifically, the pension funds' growth impacts positively on the short-term market size, growth, liquidity, efficiency, return and stability, and the long-term market size, liquidity and efficiency.

The rest of the paper is organized as follows. In Section Two, we undertake a literature review. In Section Three, we describe the data used. Section Four presents our methodology. Section Five contains our empirical results, and Section Six concludes.

2. Literature review.

Prior literature finds evidence that pension funding enhances stock market development (Holzmann, 1997a, 1997b; Catalan et al., 2000; Impavido et al., 2003, Hu; 2006; Davis and Hu, 2008), and financial development may also promote pension fund growth (Davis, 1995). Catalan et al. (2000) analyse causality between contractual savings and stock market development in 26 countries and find mixed results: causality in both directions for

most countries, only in one direction for others, and absence in some others. These results reveal the need to examine the relationship between pension funds and stock markets before studying the impact of pension funds on stock market.

The relation between pension funds and stock markets has been studied mainly using two market measures: market capitalization and total value traded (Levine and Zervos, 1998). The market capitalization is a proxy of the market size, and the total value traded is a liquidity proxy. Catalan et al. (2000) find that contractual savings influence on market capitalization, but not on stock value traded. Impavido et al. (2003) find that the institutionalization of savings increases the depth of stock and bond markets and, in some cases, improves stock market liquidity. Meng and Pfau (2010) find that pension assets have a positive effect on market size and liquidity in 32 stock markets. Hu (2012) finds a positive link between Asian occupational pension funds, market capitalization and value traded (the latter only in the short-term), especially in more developed economies.

The influence of pension funds on other market aspects has been barely examined and provides mixed results. The relation between pension funds and market activity is examined by Hu (2012), who finds that the growth of pension fund assets only improves turnover ratios of more developed economies. This result is linked to a higher competence among financial institutions, since the higher the competition, the higher the activity. Our study focuses on developed economies, so we expect higher activity levels with pension fund development.

With regard to market return and pension funds, Walker and Lefort (2002) find an inverse relation between pension fund growth and dividend yield at 33 emerging economies. Hu (2006) shows a positive effect of pension asset growth on equity prices in OECD and emerging economies. Zandberg and Spierdijk (2013) point out a two-sided relationship: high market return increases the growth of pension assets and vice versa. Although the relation between market return and pension funds is not clear, we expect to find similar results to those found between market size and pension funds. Indeed, to capture the market growth both via assets and return, we also study the impact of pension funds on market flows, a proxy of market growth that takes into account the market development due to assets and return.

Concerning market volatility, Cohen (1998) and Dennis and Strickland (2002) argue that institutional investors can restore the long-term equilibrium by avoiding great market volatility. Walker and Lefort (2002) find, in 33 emerging economies, that pension reforms promoting pension funds reduce market volatility. Faugere and Shawky (2003) find that institutional investors held stocks with less volatility during the market decline in 2000, which stabilizes the market. Bohl et al. (2009) provide evidence of lower Polish stock market

volatility after the appearance of pension funds in the country in 1999. Thomas et al. (2014) support a negative relation between the share of pension fund assets invested in stocks and stock market volatility for 34 OECD countries from 2000 to 2010. In contrast, Davis (2004) and Davis and Hu (2004) study the influence of pension and life insurance assets across G-7 countries and show a positive link between equity price volatility and the equity share held by pension funds and life insurance. Hu (2006) also finds a positive relation between pension fund and market volatility from 1960 to 2004 for 16 OECD countries and 8 emerging countries. Despite the contrary results, we expect that the long-term nature of pension funds helps to market stability, decreasing volatility.

3. Data and sample description.

We examine the link between equity pension funds and stock markets of 8 European countries (Belgium, Denmark, Finland, Norway, Sweden, Spain, Portugal and United Kingdom) using financial and macroeconomic data from the World Development Indicators database[1], MSCI[2], and from Morningstar Direct database.

The selection of these countries resides in the fact that these pension fund industries have experienced an outstanding development in recent decades, being amongst the most developed European pension fund industries, amounting to more than €2.5 trillion assets under management. This investment represents more than 53% of the European pension fund investment, and almost 12% of the worldwide investment in 2014, according to INVERCO (2015).

Additionally, these countries are also representative of the different European pension systems, which have promoted diverse evolution of the industries. Specifically, Belgium belongs to the continental system, characterized by small public pensions, which has emphasized pension fund development. Denmark, Finland, Norway and Sweden belong to the Nordic system, distinguished by high social protection and mixed pension systems (combination of a pay-as-you-go defined contribution and a defined contribution privately managed financial account scheme). Portugal and Spain belong to the Mediterranean system, in which public pensions are notable, so the pension fund industry appeared late but has experienced and important development over the last decades, due to doubts concerning the viability of the public systems and favorable tax treatments. Finally, United Kingdom belongs to the Anglo-Saxon system, marked by lower public pensions, which has encouraged a remarkable pension fund growth.

[1] World development indicators database: http://data.worldbank.org/data-catalog/world-development-indicators
[2] MSCI: https://www.msci.com/

Table 1 shows the evolution of these pension fund industries from 1995 to 2014. We observe that all countries, except Portugal, have experienced a remarkable growth during this period, and the current crisis only has negatively impacted on Finland, Spain and Portugal in 2011 and, Denmark and Sweden in 2013, displaying the long-term nature of this investment.

The United Kingdom pension fund industry is the most developed in Europe (and the second in the world after the United States) with more than €2.1 trillion in 2014. Then, we find Denmark, Finland and Spain with an investment of €110, €105 and €99 billion in 2014, respectively. Sweden, Norway and Belgium have more moderated pension fund industries, even though; they represent more than 9% of the GDP (INVERCO, 2015). Only Portugal has experienced a more erratic evolution, but it shows a positive trajectory since 2012.

Table 1 near here

Since our sample is made up by established stock markets and pension fund industries, we then expect to find a positive link between both markets, given that financial literature finds that stock markets of more developed countries are further entrenched (La Porta et al., 1997; Rajan and Zingales, 2003; La Porta et al., 2006), and successful private pension progress requires certain prior development of the financial sector (Davis, 1995).

The data obtained from the World Development Indicators are financial and macroeconomic variables in annual basis from 1988 to 2013. The country-market indices are obtained from MSCI, and the pension fund data comes from Morningstar Direct database.

The financial data are the dependent variables. The stock market capitalization[3] over the GDP (Mc_GDP) is a proxy of the market size. The market value traded[4] over the GDP (Vt_GDP) is the proxy of the market liquidity. The turnover ratio is the market activity indicator, and is the total value of shares traded during a period divided by the average market capitalization over the period; therefore, it compares the liquidity level with regard to the market size. We obtain market return and market volatility through the calculation of the annual return and total risk from the daily country-market indices from 1988 to 2013. The market flows, as proxy of the market growth, is the net growth beyond reinvested dividends: $[Mc_{i,t} - Mc_{i,t-1}*(1+R_{i,t})]/ Mc_{i,t-1}$; where $Mc_{i,t}$ is the market capitalization in period *t*, and $R_{i,t}$ is the market return in *t*.

The macroeconomic data are the inflation rate, the real interest rate and the GDP growth. The inflation rate is an indicator of macroeconomic stability (Thomas et al. 2014), measured by the annual consumer prices from each country, and it reflects the annual

[3] The market capitalization is the share price times the number of shares outstanding.
[4] The market value traded is the total value of stocks traded during a period.

percentage change in the cost to the average consumer of acquiring a basket of goods and services. The real interest rate, included as proxy of macroeconomics conditions, is the lending interest rate adjusted for inflation as measured by the GDP deflator. Catalan et al. (2000) indicate that the development of contractual savings should imply long-term interest decrease with regard to short-term interest rate to promote long-term growth. The GDP growth is the annual percentage growth rate of GDP at market prices based on constant local currency.

The pension fund data include the assets and return of all pension funds for each country, distinguishing the investment locations. We then select the domestic equity pension funds and calculate the portion of domestic equity pension fund assets over the total pension fund assets, the portion of domestic equity pension fund assets over GDP, and the domestic equity pension fund return from 1988 to 2013, in annual basis.

Table 2 shows some summary statistics of the variables included in our study: market capitalization over GDP (Mc_GDP), value traded over GDP (Vt_GDP), turnover ratio, market flows, market return, market volatility, inflation rate, real interest rate, GDP growth, share of domestic equity pension fund assets over total pension fund assets, share of domestic equity pension fund assets over GDP, and domestic equity pension fund return. Panel A shows the pooled statistics for all countries analyzed. Panel B shows the average variables by country.

Table 2 near here

Panel A shows that the average market capitalization and value traded over the GDP are 64.7% and 54.7%, respectively, confirming that the countries studied exhibit large and liquid markets, a characteristic of develop economies. The average inflation rate is 2.8%, the average interest rate is 5.2%, and the GDP growth is 1.8%. On average, the domestic equity pension fund assets represent 16.8% and 1% over the total pension fund assets and country-specific GDP, respectively. The average pension fund return (13.8%) is higher than the market return (0.7%).

Panel B shows that the UK possesses the most developed market, presenting the highest market capitalization over GDP (1.196), the highest value traded over GDP (1.043) and the lowest volatility (0.045); however, the UK presents the lowest equity pension fund investment over GDP (0.3%). On the other hand, Portugal shows the most fragile stock market, economy and pension fund market. The market capitalization over GDP, the market return, the interest rate, the GDP growth, the equity pension fund investment over GDP and the pension fund return are the lowest, while the inflation is the highest.

Panel B also reveals the generalized small pension fund investment in equity (over the total pension assets and over the GDP). These small figures may due to the conservative character of the pension fund investors and the lower investment in equities since the financial crisis, in favour of bill and bond investments (OECD, 2015a). We should clarify that we focus on pension funds that invest in equities; nonetheless, the assets finally invested by these funds in stocks vary over time and among countries, mainly due to regulation restrictions (pension funds can invest in stocks up to 50% of the investment in Finland, 70% in Denmark, and 100% in Belgium, Norway, Portugal, Spain, Sweden and the UK, -OECD, 2015b-).

4. Methodology.

We divide our methodology into two parts. First, we use a Granger-bivariate causality analysis to study the relationship between pension funds and stock markets. Second, we examine the influence of pension funds on the stock market, considering possible causality relations by a panel error correction model.

4.1. Causality analysis.

Financial literature (Davis, 1995; Catalan et al., 2000) indicates that pension funds implement active and sophisticated strategies that require enough large and liquid stock markets, being difficult its effective implementation when capital markets are small and illiquid. Consequently, pension funds can promote stock market development, but stock markets can also provide a supportive environment for pension funds, enabling the existence of a bi-directional causal relationship.

The existence of any causal relationship between variables can be analysed by the causality test of Granger (1969). The Granger causality test examines whether there is a one-side, two-side or not causal relation between two variables.

We examine whether pension fund influence on stock market (size, liquidity, activity, growth, return and volatility), whether stock market influence on pension funds, or whether the above two relationships exit; that is, it exits a two-way causation; or whether there is not causation in any direction.

The bivariate Granger causality test is based on the following OLS regression:

$$y_t = \alpha_0 + \sum_{i=1}^{p} \beta_i y_{t-i} + \sum_{j=1}^{q} \beta_i x_{t-j} + \mu_t \qquad (1)$$

Where y is the dependent variable, x is the exogenous variable (p and q are chosen), and μ is white noise.

The test conducted is an F test on the *q* parameters for the variable *x* with the null hypothesis of causality absence. The test distribution is F(*n*, *n*-2q-1) over *n* observations. This test is only asymptotically valid, so the $\chi^2(q)$ asymptotic equivalent test can be applied (Granger, 1969; and Hamilton, 1994).

4.2. Stock market and pension fund relationship.

We estimate a panel error correction model (PECM), popularized by Davidson et al. (1978), to assess the domestic equity pension fund influence on the stock market. This model deals with possible causality issues and allows identifying short- and long-term relationships simultaneously between variables (Banerjee et al., 1986; Hu, 2012). The estimation methodology is weighted generalized least squares (GLS).

The PECM proposed to study the influence of equity pension funds on market development, following Hu (2006, 2012), is as follows:

$$Y_{i,t} = \alpha_0 + \beta_1 \log(equityPF)_{i,t} + \beta_2 I_{i,t} + \beta_3 IR_{i,t} + \beta_4 GDPgr_{i,t} + \beta_5 ECM_{i,t\text{-}1} + \\ + \beta_6 \log(equityPF)_{i,t\text{-}1} + \beta_7 I_{i,t\text{-}1} + \beta_8 IR_{i,t\text{-}1} + \beta_9 GDPgr_{i,t\text{-}1} + \varepsilon_{i,t} \quad (2)$$

$$ECM_{i,t\text{-}1} = Y_{i,t\text{-}1} - \lambda_1 \log(equityPF)_{i,t\text{-}1} \quad (3)$$

Where $Y_{i,t}$ corresponds to the different market variables (market capitalization, value traded, turnover ratio, market flows, market return or market volatility) of country *i* and time *t*; $log(equityPF)_{i,t}$ is the logarithm of the ratio between domestic equity pension fund assets and total pension fund assets at a country level; $I_{i,t}$ represents the inflation rate of country *i* and time *t*; $IR_{i,t}$ is the real interest rate of country *i* and time *t*; $GDPgr_{i,t}$ is the GDP growth of country *i* and time *t*; and $ECM_{i,t}$ is the error correction model term measuring the convergence speed from short to long run equilibrium, and it corrects possible causality issues between pension funds and market variables. A negative ECM shows a co-integration relation. The level and lagged variables show the short and long run relationship with the dependent variable, respectively.

Additionally, we develop an alternative model and introduce the weight of domestic equity pension funds over the country-specific GDP (instead of total pension fund assets) to control the pension fund importance in the domestic economy. The proposed model is as follows:

$$Y_{i,t} = \alpha_0 + \beta_1 \log(equityPF/GDP)_{i,t} + \beta_2 I_{i,t} + \beta_3 IR_{i,t} + \beta_4 GDPgr_{i,t} + \beta_5 ECM_{i,t\text{-}1} + \\ + \beta_6 \log(equityPF/GDP)_{i,t\text{-}1} + \beta_7 I_{i,t\text{-}1} + \beta_8 IR_{i,t\text{-}1} + \beta_9 GDPgr_{i,t\text{-}1} + \log(totalPF)_{i,t} + \varepsilon_{it} \quad (4)$$

$$ECM_{i,t\text{-}1} = Y_{i,t\text{-}1} - \lambda_1 \log(equityPF/GDP)_{i,t\text{-}1} \quad (5)$$

Where: $Y_{i,t}$ corresponds to the different market variables (market capitalization, value traded, turnover ratio, market flows, market return or market volatility) of country *i* and time *t*; $log(equityPF/GDP)_{i,t}$ is the logarithm of the ratio between the domestic equity pension fund assets and the Gross Domestic Product (GDP) in country *i* and time *t*; $I_{i,t}$ represents the inflation rate of country *i* and time *t*; IR_{it} is the real interest rate of country *i* and time *t*; $GDPgr_{i,t}$ is the GDP growth of country *i* at *t*; and $log(totalPF)_{i,t}$ is the logarithm of the total pension fund assets of country *i* and time *t*, included as control variable of the pension fund industry size.

With regard to the dependent and short-term variables of models (2) and (4), the PECM specifies that these variables must be stationary, consequently, variables are included in level terms or in differences (when they become stationary after differencing).

Therefore, the estimation of the appropriated model requires a preliminary stationary analysis (Beck and Levine, 2004) to include variables in level terms or differences, depending on when they become stationary (Hu, 2006). We apply the stationary test proposed by Im, Pescamann and Shin (2003) (hereafter IPS), an extended version of the Augmented Dickey-Fuller test, allowing heterogeneity across countries. Considering the following model:

$$y_{i,t} = \rho_i y_{i,t\ 1} + X_{i,t}\delta_i + \varepsilon_{i,t} \quad where\ i = 1...N;\ \ t = 1_{i,t} \qquad (6)$$

Where $y_{i,t}$ is the dependent variable, $X_{i,t}$ is the vector of exogenous variables, and $\varepsilon_{i,t}$ are i.i.d. $(0,\sigma^2_{\varepsilon})$.

The IPS test formulation is as follows:

$$\Delta y_{i,t} = \alpha_i y_{i,t\text{-}1} + \sum_{j=1}^{p_i} \beta_{i,j} \Delta y_{i,t\text{-}j} + X_{i,t}\delta_i + \varepsilon_{i,t} \quad where\ i = 1...N;\ \ t = 1...T \qquad (7)$$

It is assumed that *y* follows an AR(*p*) process and, therefore, *p* lagged difference terms of the dependent variable *y* are added on the right-hand side of the equations. The optimal lag order (p_i) is allowed to vary across countries; $\beta_{i,j}$ is the coefficient on lagged difference terms of the *y* series.

The IPS tests whether α_i is zero for all *i*, and it uses the t-bar statistics to test the null hypothesis of unit root existence, which are formed as the average of the individual t-statistic for testing $\alpha_i = 0$.

$$t - bar_{NT} = N^{-1}\sum_{i=1}^{N} t_{iT} \qquad (8)$$

Finally, in the analysis we examine the influence of pension fund on market return and market volatility using the domestic equity pension fund return, because both pension returns

and assets might influence market return and, by extension, market volatility (Walker and Lefort, 2002; Zandberg and Spierdijk, 2013). The model is as follows:

$$Y_{i,t} = \alpha_0 + \beta_1 R_{PF\,i,t} + \beta_2 I_{i,t} + \beta_3 IR_{i,t} + \beta_4 GDPgr_{i,t} + \beta_5 ECM_{i,t\text{-}1} + \\ + \beta_6 R_{PF\,i,t\text{-}1} + \beta_7 I_{i,t\text{-}1} + \beta_8 IR_{i,t\text{-}1} + \beta_9 GDPgr_{i,t\text{-}1} + \varepsilon_{i,t} \quad (9)$$

$$ECM_{i,t\text{-}1} = Y_{i,t\text{-}1} - \lambda_1 R_{PF\,i,t\text{-}1} \quad (10)$$

Where $R_{PFi,t}$ is the domestic equity pension fund return of country *i* and time *t*.

5. Results.

In this section, we first study the causality between variables by the Granger test. Second, we study the stationarity of the variables with the IPS test, and we then examine the influence of equity pension funds on the stock market considering the causality and the stationarity results.

5.1. Granger causality.

The Granger causality results are collected on Tables 3 and 4. Table 3 shows the results between the stock market variables and the share of domestic equity pension funds over the total PF assets (panels A-B) and between the market return and volatility and the pension fund return (panels C-D). Table 4 shows the results between the stock market variables and the share of domestic equity pension funds over GDP.

Table 3 is divided into four panels. Panel A shows the Granger causality results from the different dependent variables studied (market capitalization over GDP, traded value over GDP, turnover ratio, market flows, market return and market volatility) to the domestic equity pension fund assets over the total assets. Panel B shows causality results from the domestic equity pension fund assets over the total assets to the market variables studied. Panel C shows the causality results from market return and volatility to pension fund returns. Panel D shows the causality results from the pension fund returns to the market return and the market volatility.

Table 3 near here

Comparing panels A and B, is observed that market capitalization and equity pension funds present a bi-directional relationship; that is to say, the hypothesis that market capitalization does not present Granger-cause with equity pension funds is rejected (the F-statistic is 13.17 and the χ^2-statistic is 40.08 in panel A); and the hypothesis that equity pension funds do not present Granger-causality to market capitalization is also rejected (panel B). With regard to total value traded over GDP, turnover ratio and market flows, we also observe a two-side relationship between the market variables and the equity pension fund

assets, since null hypotheses are rejected. Catalan et al. (2000) also find similar relation among pension funds, market capitalization and value traded.

On the other hand, the relationship of market return and market volatility with equity pension fund assets only displays causal relationship from the market to pension funds, and not otherwise. Nonetheless, prior literature (Walker and Lefort, 2002; Zandberg and Spierdijk, 2013) supports evidence that pension funds influence market return and volatility examining pension fund return, instead of pension fund assets. In panels C and D, we confirm this evidence, finding bidirectional causality (although the F-statistic is not significant from pension fund return to market volatility).

Table 4 is divided into two panels. Panel A shows the Granger causality results from the market variables studied (market capitalization over GDP, traded value over GDP, turnover ratio, market flows, market return and market volatility) to the share of domestic equity pension fund assets over GDP. Panel B shows the causality results from the share of domestic equity pension fund assets over GDP to the market variables studied.

Table 4 near here

Panels A and B show bi-directional relationships between the market variables studied (except market volatility) and the weight of domestic equity pension fund assets in the domestic economy. The relationship between market volatility and the pension fund assets is one-sided, from market to pension funds, as in Table 3.

As a result, we find a reciprocal effect between stock and pension fund markets, which supports the idea that domestic equity pension fund progress promotes stock market development, and the stock market creates a supportive environment for pension fund growth.

5.2. Stationarity results.

We perform the stationarity analysis to specify the accurate panel error corrected models (PECM). Table 5 contains the IPS test results for all variables considered in the study (the null hypothesis is the unit root existence).

Table 5 near hear

The t-bar statistics show that market capitalization and turnover ratio are stationary at 5%, while market return, market volatility, market flows, inflation, real interest rate, GDP growth and pension fund return are stationary at 1% level. Value traded over GDP and the shares of domestic equity pension assets over total pension assets and GDP are non-stationary in levels; however, these variables become stationary after first differencing.

Therefore, the level stationary variables (market capitalization, turnover ratio, market return, market volatility, market flows, inflation, interest rate, GDP growth and pension fund

return) are included in models (2), (4) and (9) in level terms, and the first-difference of the value traded and the shares of domestic equity pension fund assets (over total PF and GDP) are included in models (2) and (4).

5.3. Influence of equity pension funds in stock markets in the short- and long-term.

The impact of domestic equity pension funds on stock markets is studied considering three pension fund measures: the portion of domestic equity pension fund assets over the total pension funds, the portion of domestic equity pension fund assets over GDP, and the pension fund return.

To undertake these analyses we take into account the causality and stationary results. The causality analysis shows a bidirectional relationship between the dependent market variables and pension funds, so we first estimate models (3), (5) and (10) to calculate the ECM, and we then include the ECM in models (2), (4) and (9).

5.3.1. Influence of domestic equity pension fund assets over total PF on the market.

In this section we analyze the influence of pension funds using the domestic equity pension fund assets portion over the total PF assets. The results of model (2) are collected in Table 6. This Table shows the impact of domestic equity pension fund assets on the stock market variables studied. The stationary dependent and short-term variables are included in level terms, and the first-difference stationary variables are included in first differences (Value traded over GDP and equity pension fund assets portion).

Table 6 near here

Table 6 shows that the short-run pension fund coefficient (β_1) is significantly positive in all regressions, except in the market volatility analysis, which is insignificantly negative. This evidences that domestic equity pension fund assets have positive short-term impact on the market size (market capitalization), liquidity (value traded), activity (turnover ratio), growth (flows) and return. These results present some differences with regard to prior results. Hu (2012) does not find short-term influence of occupational pension funds on market capitalization, value traded and turnover for developed Asian-Pacific economies. The discrepancy with prior results may be found in the markets analyzed. We study developed and well-functioning European stock markets; therefore, they are able to incorporate new information in the short-term and show the immediate pension fund impact, symptom of market efficiency.

On the other hand, the influence of pension funds in the long-term (β_6) is significant and positive on market capitalization, flows and return. These outcomes confirm that the enduring nature of pension funds allows long-term market growth. However, ours results

evidence some differences with prior works. Meng and Pfau (2010) find positive influence on market capitalization and value traded for developed markets. Our lack of long-term results in market liquidity and activity may be justified by the lower tendency of pension funds to reallocate investments (Sialm, 2015), performing lower number of operations (buy-sell) and holding the same stocks longer. Another explanation may be found in the markets studied. Hu (2012) finds that pension funds only influence market capitalization and traded value in less developed Asian economies, and the turnover is negatively affected in more developed economies.

With regard to the inflation's influence, the market capitalization, flows and return decrease when inflation increases (significantly negative β_2 coefficients), liquidity and activity are not affected by inflation, and market volatility increases when inflation rises. This shows that increasing prices destabilize the market in the short-term, rising market volatility and reducing market expansion. On the other hand, a long-term positive inflation (β_7 coefficients) enhances market capitalization, activity and market return, and reduces market volatility. This opposite behaviour might be explained because increasing prices threaten the existing equilibrium, starting a transition period that usually leads to an economic growth period.

The real interest rate coefficients (β_3 and β_8) present an inverse relation with the turnover ratio in the short- and long-term, and with the value traded and market volatility in the long-term (β_8). That is, an increase of interest rates has a negative impact on market liquidity and activity because investors choose other investments rather than equities when interest rates increase, decreasing trading and volatility. This result is in line with Catalan et al. (2000), who indicate that a long-term interest rate decrease promotes long-term growth.

Regarding the economic situation, economic growth improves short-term market size (significantly positive β_4), decreases short-term volatility (significantly negative β_4), and increases long-term market liquidity (significantly positive β_9). Finally, the ECM coefficients (β_5) are not significant, indicating that we eliminate causality problems in the model estimation.

Given that prior works show diverse results for developed and non-developed economies, and we study countries with different pension fund systems and characteristics,

we repeat our analysis considering possible heterogeneity among countries. Results are shown in Table 7[5].

Insert Table 7 near hear

Table 7 displays some differences with regard to Table 6. Although the pension fund growth (β_1) still influences positively on short-term market development (capitalization and flows), the impact on value traded and turnover turns not significant in short-term and significantly positive in long-term. Additionally, the long-term influences on flows and return are not significant, and pension funds help to short-term market stability (significantly negative β_1 in market volatility).

These results contrast with some of our prior arguments, revealing distinct patterns among countries. We confirm that higher pension fund investment supports short- and long-term market expansion. On the other hand, justifying that pension fund expansion only contributes to long-term market liquidity and activity is complex. We previously argue that the long-term nature of pension funds may induce sticky behaviour (Sialm, 2015) and have repercussions on short-term rather than long-term. Nonetheless, despite this possible lower reallocation frequency, pension fund reallocations usually involve large amount of assets, which might produce long-term repercussions in liquidity and activity, given the considerable number of investors and stocks involved over time. Even so, we should take this outcome with caution and will study whether the same conclusions are reached when including the pension fund assets weight over GDP in the next section.

In the same line, the no influence on long-term market return and volatility may be related with the selected pension fund variable (pension fund assets). Pension fund assets may present lower correlation than pension fund return with these two market variables, so pension fund return may report stronger evidence. In order to test this hypothesis, we undertake this analysis in section 5.3.3, including the pension fund return as representative pension fund variable.

5.3.2. Influence of pension fund assets over GDP in the market.

In this section we repeat the prior analyses considering the weight of domestic equity pension fund assets over country-specific GDP as pension fund measure. This alternative measure, as we explained above, is a more instructive measure and allows us to incorporate the pension fund importance in the economy. Table 8 shows the results of model (4).

[5] Instead of estimating a fixed effect model, we control for country-specific characteristics in the proposed PECM model because this model allows us to deal with the causality problems detected.

Insert Table 8 near here

Table 8 shows that the pension fund expansion contributes to short-term stock market growth and stability (flows and return β_1 coefficients are significantly positive, and the market volatility β_1 coefficient is significantly negative). These results reveal that the higher the pension fund assets, the higher the market flows, the market return, and the lower the market volatility in the short-term. The market capitalization, the value trade and the turnover coefficients are not significant in the short-term.

The long-term results (β_6) show significant and positive relationships for value traded and turnover; that is, pension fund allocations and re-allocations provides liquidity and enhances market activity. This evidence allows us to clarify some of the results found in Tables 6 and 7. Specifically, we observe that pension fund expansion influences positively the long-term market liquidity and activity. Pension funds are able to provide liquidity to the market because they are professionally managed and management strategies consist on re-balancing portfolios periodically, despite the fact that pension fund re-balancing is less frequent than in other products. Furthermore, the domestic equity investment location of these pension funds means that managers disinvest but invest again in domestic markets, enhancing domestic market liquidity and activity.

Subsequently, we repeat the prior analysis to control for possible country heterogeneity. Table 9 displays the results.

Insert Table 9 near here

Table 9 confirms Table 8 outcomes. Furthermore, the pension fund relationship with the long-term market capitalization turns significantly positive. Accordingly, our initial model does not suffer from large problems related to country-specific characteristics.

The findings of this sub-section confirm that including the pension fund importance over the GDP as pension fund variable allows us to provide consistent and uniform conclusions in the relationship studied. Specifically, we can conclude that the development of the pension funds studied reports benefits to the short- and long-term stock market development and the short-term stability. The differences between the short- and long-term relationships reveal that the long-term nature of pension funds especially influences in the short-term growth (market flows). Nonetheless, pension funds are powerful investment vehicles and the asset re-allocation helps to market expansion, supplies liquidity and enhances market activity in the long-term.

5.3.3. Influence of pension fund return in stock market return and volatility.

As we expected, the results of prior sections show limited influence of pension fund assets in market return and volatility, especially in the long-term. In this section, we study whether pension fund returns are able to influence market return and volatility to a greater extent.

Table 10 shows the model (9) results and is divided into two panels. Panel A shows the GLS estimation of model (9) and Panel B shows the GLS estimation of model (9) controlling country characteristics.

Table 10 near here

Panel A shows a positive relationship between pension fund return and short-term market return (β_1 is significantly positive), and absence of relation in the long-term. The market volatility analysis shows that the pension fund return presents a negative relationship with market volatility in the short- and long-terms (β_1 and β_6 are significantly negative); demonstrating that pension funding helps to market stability, in line with the results of Thomas et al. (2014). Panel B confirms the results of Panel A and displays stronger evidence of the positive and negative relationships between the pension fund return and both short- and long-term market return and volatility, respectively. These results confirm our initial hypothesis that market return and volatility are further affected by pension fund returns than by pension fund assets.

6. Conclusions.

Over the last decades, several governments have implemented diverse measures (mainly tax exemptions) to enhance pension fund investment. The long-term nature of these assets produces enduring effects in financial markets and, by extension, helps to diminish the effect of the current economic and demographic situations in future public pensions.

Studying the effect of pension fund expansion in domestic stock markets requires focusing on the pension fund assets invested in domestic stock markets; however, existing studies examine the influence of all pension fund assets and do not consider that pension funds usually invest important part of their assets abroad. To fill this gap, this work first studies the real effect of pension funds investing in domestic equities in domestic stock markets, both in the short- and long-run.

Specifically, we analyze the influence of domestic equity pension funds on eight European stock markets, both in the short- and long-term. We perform a complete analysis examining the pension fund impact on market size, liquidity, activity, growth, return and volatility. Additionally, we use three different pension fund variables to measure this influence: the weight of the domestic equity pension fund assets over the total pension fund

assets (as variable of the importance of this pension assets over the pension fund industry), the weight of the domestic equity pension fund assets over the country GDP to consider the importance of this pension funds in the economy, and the pension fund return, since the correlation between market return and market volatility with pension fund assets may be lower than with pension fund return.

Our empirical results initially show a two-side causal relation between stock markets and pension funds. This evidences that stock markets display a supportive environment for pension funds, and domestic equity pension funds also promote stock market development.

Considering the bidirectional causality in the analysis, our results demonstrate that the expansion of domestic equity pension funds contributes to the development and stability of the stock market. With regard to prior studies, we find that domestic equity pension funds influence stock markets to a greater extent in the short-term. Specifically, the pension funds' growth impacts positively on the short-term market size, growth, liquidity, activity, return and stability. Nonetheless, we also discover that the long-term nature of these vehicles produces enduring effects, finding that pension fund expansion positively impacts on the long-term market size, liquidity and activity. Additionally, as we expected, the relationships between the market return and volatility with the pension fund return are stronger than with pension fund assets.

Overall, the different analyses carried out in this work draw the same conclusion: pension funding in domestic equities allows domestic stock market development and stability. Consequently, the measures that try to enlarge stock markets through expanding pension funds will produce the desired effect, providing, by extension, more retirement savings to pension fund participants.

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Table 1: Assets managed by pension fund from 1995 to 2014

	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
UK	643	1240	1416	1622	1487	972	1264	1510	1725	1918	1941	2150
Denmark	30	40	70	71	73	112	96	116	119	122	106	110
Finland	10	12	108	119	127	113	133	148	83	91	98	105
Spain	13	38	66	74	86	78	85	85	83	87	93	99
Sweden	10	18	26	30	28	21	25	35	36	44	39	40
Norway	7	13	16	18	20	16	21	25	26	30	30	30
Belgium	7	15	13	13	15	11	14	13	16	17	20	22
Portugal	25	35	19	21	22	20	22	20	13	14	15	16

Source: INVERCO, OCDE.

Table 1 shows the assets managed by pension funds (in billion of Euros) for the countries studied (Belgium, Denmark, Finland, Norway, Sweden, Spain, Portugal and United Kingdom) from 1995 to 2014.

Table 2: Summary statistics

Panel A: Summary statistics for all countries

	Mean	Std. Dev.	Min	Max
Mc_GDP	0.647	0.415	0.086	2.584
Vt_GDP	0.547	0.555	0.012	3.484
Turnover ratio	0.778	0.486	0.091	2.698
Market flows	0.124	0.285	-0.576	1.176
Market return	0.007	0.023	-0.079	0.085
Market volatility	0.063	0.026	0.015	0.193
Inflation rate	0.028	0.022	-0.008	0.134
Real interest rate	0.052	0.035	-0.058	0.151
GDP Growth	0.018	0.024	-0.083	0.075
Equity PF over total PF assets	0.168	0.255	0.002	1
Equity PF over GDP	0.01	0.0275	$2.95*10^{-6}$	0.146
Equity pension fund return	0.138	0.284	-0.642	1.088

Panel B: Variables by country

	Belgium	Denmark	Finland	Norway	Portugal	Spain	Sweden	UK
Mc_GDP	0.546	0.500	0.785	0.406	0.301	0.597	0.846	1.196
Vt_GDP	0.176	0.332	0.682	0.368	0.177	0.834	0.762	1.043
Turnover ratio	0.309	0.651	0.888	0.853	0.533	1.254	0.851	0.887
Market flows	0.108	0.110	0.152	0.175	0.133	0.130	0.112	0.075
Market return	0.006	0.011	0.009	0.009	0.002	0.007	0.011	0.005
Market volatility	0.052	0.054	0.084	0.071	0.063	0.066	0.070	0.045
Inflation rate	0.022	0.023	0.023	0.024	0.045	0.036	0.025	0.028
Real interest rate	0.066	0.075	0.048	0.048	0.024	0.054	0.049	0.059
GDP Growth	0.020	0.014	0.020	0.018	0.010	0.023	0.020	0.021
Equity PF over total PF assets	0.101	0.056	0.235	0.191	0.065	0.521	0.090	0.081
Equity PF over GDP	0.004	0.004	0.004	0.007	0.003	0.004	0.048	0.003
Equity pension fund return	0.127	0.156	0.204	0.195	0.050	0.090	0.165	0.106

Table 2 shows some descriptive statistics (mean, standard deviation, minimum and maximum) of the different variables used in the study: market capitalization over the GDP (Mc_GDP), value traded over the GDP (Vt_GDP), turnover ratio, market flows, market return, market volatility,

inflation rate, real interest rate, GDP growth, share of domestic equity pension fund assets over the total pension fund assets, share of domestic equity pension fund assets over country-specific GDP, and equity pension fund return from 1988 to 2013. Panel A shows the pooled statistics for all countries analyzed. Panel B shows the average variables by country.

Table 3. Bivariate Granger causality test results of domestic equity pension fund (PF) assets over total PF assets and pension fund return with regard to market variables.

Panel A: Causality from ….. to pension fund assets:		
	F (1, 267)	Chi2
Mc_GDP	13.168***	40.081***
Vt_GDP	57.587***	175.291***
Turnover ratio	74.004***	225.26***
Market flows	21.225***	64.608***
Market return	18.246***	55.538***
Market volatility	24.357***	74.139***
Panel B: Causality from pension fund assets to:		
	F (1, 267)	Chi2
Mc_GDP	22.826***	69.48***
Vt_GDP	22.852***	69.56***
Turnover ratio	26.75***	81.424***
Market flows	22.903***	69.714***
Market return	0.09	0.275
Market volatility	0.009	0.028
Panel C: Causality from…… to pension fund return:		
	F (1, 267)	Chi2
Market return	7.9***	24.048***
Market volatility	9.025***	27.471***
Panel D: Causality from pension fund return to:		
	F (1, 267)	Chi2
Market return	4.234**	12.888***
Market volatility	1.71	5.204**

Table 3 shows the Granger causality test results (F and χ^2 statistics), and is divided into four panels. Panel A shows the causality test results from the different market variables studied (market capitalization over the GDP -Mc_GDP-, value traded over the GDP -Vt_GDP-, turnover ratio, market flows, market return and market volatility) to pension fund assets (share of domestic equity pension fund assets over the total pension fund assets). Panel B shows the causality test results from the pension fund assets (share of domestic equity pension fund assets over the total pension fund assets) to the different market variables studied (market capitalization over the GDP -Mc_GDP-, value traded over the GDP -Vt_GDP-, turnover ratio, market flows, market return and market volatility). Panel C shows the causality test results from market return and market volatility to domestic equity pension fund return. Panel D shows the causality test results from domestic equity pension fund return to market return and market volatility. The null hypothesis is absence of causality. *,**, and *** indicate rejection of null hypothesis at the 10%, 5%, and 1% level, respectively.

Table 4. Bivariate Granger causality test results of domestic equity pension fund assets over GDP with regard to market variables.

Panel A: Causality from ….. to domestic equity pension fund assets over GDP:		
	F (1, 205)	Chi2
Mc_GDP	30.265***	92.125***
Vt_GDP	77.780***	236.755***
Turnover ratio	83.940***	255.506***
Market flows	29.815***	90.753***
Market return	13.390***	40.758***
Market volatility	48.134***	146.517***
Panel B: Causality from domestic equity pension fund assets over GDP to:		
	F (1, 205)	Chi2
Mc_GDP	32.989***	100.415***
Vt_GDP	29.240***	89.004***
Turnover ratio	28.714***	87.402***
Market flows	108.995***	331.769***
Market return	34.249***	104.253***
Market volatility	0.307	0.933

Table 4 shows the Granger causality test results (F and χ^2 statistics), and is divided into two panels. Panel A shows the causality test results from the different market variables studied (market capitalization over the GDP -Mc_GDP-, value traded over the GDP -Vt_GDP-, turnover ratio, market flows, market return and market volatility) to the domestic equity pension fund assets over GDP. Panel B shows the causality test results from the domestic equity pension fund assets over GDP to the different market variables studied (market capitalization over the GDP -Mc_GDP-, value traded over the GDP -Vt_GDP-, turnover ratio, market flows, market return and market volatility). The null hypothesis is absence of causality. *,**, and *** indicate rejection of null hypothesis at the 10%, 5%, and 1% level, respectively.

Table 5. Stationarity results.

Variable	Level	First difference
Mc_GDP	-2.094**	n.a.
Vt_GDP	-1.806	-4.696***
Turnover ratio	-2.204**	n.a.
Market return	-5.089***	n.a.
Market volatility	-4.424***	n.a.
Market flows	-4.597***	n.a.
Inflation rate	-2.479***	n.a.
Real interest rate	-4.091***	n.a.
GDP Growth	-2.942***	n.a.
Log equity PF over total PF	-1.734	-5.006***
Log equity PF over GDP	-1.658	-6.374***
Equity pension fund return	-4.844***	n.a.

Table 5 shows the unit root results of the IPS test for the market capitalization over the GDP (Mc_GDP), value traded over the GDP (Vt_GDP), turnover ratio, market flows, market return, market volatility, inflation rate, interest rate, GDP growth, share of domestic equity pension fund assets over the total pension fund (PF) assets (in logarithms), share of domestic equity pension fund (PF) assets over GDP (in logarithms), and domestic equity pension fund return. The null hypothesis is the existence of unit root. *,**, and *** indicate rejection of null hypothesis at the 10%, 5%, and 1% level, respectively. n.a. means not available because these variables are stationary in level terms.

Table 6. Influence of domestic equity pension fund assets over total pension fund assets on stock market.

	Mc_GDP	Vt_GDP	Turnover ratio	Market flows	Market return	Market volatility
α_0	0.128*	0.884***	0.886***	0.175*	0.02**	0.067***
	(1.76)	(0.196)	(5.34)	(1.73)	(2.31)	(7.01)
β_1	0.102*	0.293*	0.347**	0.15*	0.014*	-0.009
	(1.66)	(0.166)	(2.47)	(1.76)	(1.85)	(-1.07)
β_2	-11.728***	0.588	5.265	-13.554***	-1.409***	0.666***
	(-6.25)	(5.061)	(1.23)	(-5.19)	(-6.1)	(2.67)
β_3	-0.328	-2.342	-2.892**	-0.986	-0.067	0.099
	(-0.53)	(1.663)	(-2.05)	(-1.15)	(-0.89)	(1.2)
β_4	2.384**	0.821	0.214	2.017	0.208	-0.454***
	(2.08)	(3.09)	(0.08)	(1.27)	(1.47)	(-2.97)
β_5	0.571	-2.473	-2.209	1.468	-0.195	3.561
	(0.44)	(2.399)	(-0.86)	(0.64)	(-0.08)	(1.38)
β_6	0.039*	-0.029	-0.014	7.828**	0.004*	0
	(1.79)	(0.059)	(-0.28)	(2.54)	(1.67)	(-0.17)
β_7	5.701***	1.296	8.47*	0.958	0.597**	-0.632**
	(2.58)	(5.969)	(1.67)	(1.12)	(2.22)	(-2.17)
β_8	0.017	-4.907***	-3.34**	0.036	0.097	-0.165**
	(0.03)	(1.652)	(-2.38)	(1.2)	(1.28)	(-2.02)
β_9	-1.98*	5.876*	3.28	-2.16	-0.09	-0.06
	(-1.66)	(3.214)	(1.2)	(-1.3)	(-0.64)	(-0.39)

Table 6 shows the results of the panel error corrected model (2), estimated with cross-section weighted generalized least squares. The columns show the results considering different market dependent variables (market capitalization over the GDP -Mc_GDP-, value traded over the GDP -Vt_GDP-, turnover ratio, market flows, market return and market volatility). α_0 is the constant, β_1, β_2, β_3 and β_4 reveal the short-term influence of domestic equity pension fund assets over total pension fund assets (in logarithms), inflation, real interest rate and GDP growth on the different market variables, respectively; β_5 represents the E*CM* and measures the speed of convergence from short to long run equilibrium; β_6, β_7, β_8 and β_9 display the long-term influence of domestic equity pension fund assets over total pension fund assets (in logarithms), inflation, real interest rate and GDP growth on the different market variables, respectively. Z-statistics are in parenthesis. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 7. Influence of domestic equity pension fund assets over total PF on stock market controlling for country heterogeneity.

	Mc_GDP	Vt_GDP	Turnover ratio	Market flows	Market return	Market volatility
α_0	1.191***	1.213***	0.189	0.092	0.013***	0.065***
	(8.09)	(5.5)	(0.00)	(0.64)	(0.462)	(4.76)
β_1	0.662*	0.858	0.629	0.825**	0.075***	-0.051*
	(1.93)	(1.47)	(1.26)	(2.44)	(2.71)	(-1.65)
β_2	-13.447***	-2.798	3.295***	-14.511***	0.23***	0.485*
	(-5.75)	(-1.02)	(0.99)	(-7.28)	(0.00)	(1.72)
β_3	-1.387	-2.994**	-3.122***	-1.36	-0.076	0.043
	(-1.49)	(-2.07)	(-2.77)	(-1.53)	(-0.94)	(0.5)
β_4	1.533	-1.009	1.977***	2.673*	0.139***	-0.33**
	(1.00)	(-0.53)	(0.326)	(1.73)	(0.39)	(-2.24)
β_5	-5.496*	-4.872	-5.702	35.584	0.994	6.508
	(-1.8)	(-1.46)	(-1.63)	(0.88)	(0.26)	(1.56)
β_6	0.844***	1.226***	1.054**	-0.124	0.003	-0.018
	(3.59)	(2.86)	(2.55)	(-0.61)	(0.17)	(-0.78)
β_7	-5.038*	-5.06	-2.514	9.171***	0.509**	-0.423
	(-1.84)	(-1.29)	(-0.63)	(5.09)	(2.09)	(-1.51)
β_8	-2.232**	-4.966***	-3.421***	1.199	0.135*	-0.239***
	(-2.43)	(-3.52)	(-3.1)	(1.38)	(1.7)	(-2.83)
β_9	2.742	2.027	1.098	-1.677	0.119	-0.222
	(1.53)	(0.81)	(0.47)	(-0.95)	(0.84)	(-1.44)

Table 7 shows the results of the panel error corrected model (2), estimated with cross-section weighted generalized least squares and controlling for country heterogeneity. The columns show the results considering different market dependent variables (market capitalization over the GDP -Mc_GDP-, value traded over the GDP -Vt_GDP-, turnover ratio, market flows, market return and market volatility). α_0 is the constant, β_1, β_2, β_3 and β_4 reveal the short-term influence of domestic equity pension fund assets over total pension fund assets (in logarithms), inflation, real interest rate and GDP growth on the different market variables, respectively; β_5 represents the E*CM* and measures the speed of convergence from short run to long run equilibrium; β_6, β_7, β_8 and β_9 display the long-term influence of domestic equity pension fund assets over total pension funds (in logarithms), inflation, real interest rate and GDP growth on the different market variables, respectively. Z-statistics are in parenthesis. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 8. Influence of domestic equity pension fund assets over GDP on stock market.

	Mc_GDP	Vt_GDP	Turnover ratio	Market flows	Market return	Market volatility
α_0	1.752	3.553*	2.932*	0.084	0.04	0.203**
	(1.64)	(1.93)	(1.85)	(0.08)	(0.46)	(2.08)
β_1	0.016	0.034	0.068	0.138***	0.012***	-0.009*
	(-0.03)	(0.39)	(0.89)	(2.78)	(2.85)	(-1.9)
β_2	-14.002***	-6.331	0.149	-10.089***	-1.169***	0.259
	(-4.83)	(-1.27)	(0.03)	(-3.62)	(-4.74)	(0.94)
β_3	-1.699*	-3.719**	-3.687***	-0.558	-0.059	0.039
	(-1.89)	(-2.4)	(-2.76)	(-0.64)	(-0.77)	(0.45)
β_4	2.704*	2.467	2.346	2.457	0.197	-0.549***
	(1.65)	(0.88)	(0.96)	(1.56)	(1.39)	(-3.45)
β_5	8.097***	11.579***	14.153***	39.896	1.788	-1.416
	(3.53)	(4.29)	(4.76)	(1.26)	(0.60)	(-0.44)
β_6	0.024	0.11*	0.101**	0.015	0.002	0.002
	(0.69)	(1.85)	(1.97)	(0.44)	(0.55)	(0.7)
β_7	-7.041**	-6.463	2.23	8.044***	0.636**	-0.708**
	(-2.3)	(-1.23)	(0.49)	(2.73)	(2.45)	(-2.43)
β_8	-1.913**	-3.292**	-1.59	1.385	0.11	-0.182**
	(-2.06)	(-2.06)	(-1.15)	(1.55)	(1.37)	(-2.03)
β_9	1.767	2.722	0.543	-3.228*	-0.144	0.093
	(0.98)	(0.88)	(0.2)	(-1.86)	(-0.96)	(0.55)
β_{10}	-0.039	-0.115*	-0.092*	-0.001	-0.001	-0.004
	(-1.1)	(-1.87)	(-1.73)	(-0.03)	(-0.39)	(-1.28)

Table 8 shows the results of the panel error corrected model (4), estimated with cross-section weighted generalized least squares. The columns show the results considering different market dependent variables (market capitalization over the GDP -Mc_GDP-, value traded over the GDP -Vt_GDP-, turnover ratio, market flows, market return and market volatility). α_0 is the constant, β_1, β_2, β_3 and β_4 reveal the short-term influence of domestic equity pension fund assets over GDP (in logarithms), inflation, real interest rate and GDP growth on the different market variables, respectively; β_5 represents the E*CM* and measures the speed of convergence from short run to long run equilibrium; β_6, β_7, β_8 and β_9 display the long-term influence of domestic equity pension fund assets over GDP (in logarithms), inflation, real interest rate and GDP growth on the different market variables, respectively; and β_{10} is the total pension fund assets (in logarithms) control variable. Z-statistics are in parenthesis. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 9. Influence of domestic equity pension fund assets over GDP on stock market controlling for country heterogeneity.

	Mc_GDP	Vt_GDP	Turnover ratio	Market flows	Market return	Market volatility
α_0	0.884	-0.492	0.399	-0.044	0.024	0.08***
	(0.79)	(-0.26)	(0.24)	(-0.05)	(0.31)	(5.84)
β_1	0.012	0.012	0.028	0.179***	0.012***	-0.012***
	(-0.46)	(-0.47)	(0.40)	(3.66)	(3.85)	(-2.62)
β_2	-12.4***	-1.569	2.558	-10.122***	-1.025***	0.316
	(-6.01)	(-0.33)	(0.59)	(-4.53)	(-4.79)	(1.11)
β_3	-1.851*	-3.126**	-3.242**	-0.926	-0.093	0.04
	(-1.91)	(-2.04)	(-2.48)	(-0.95)	(-1.06)	(0.48)
β_4	3.343**	1.866	0.801	1.553	0.112	-0.442***
	(2.47)	(0.89)	(0.41)	(1.08)	(0.86)	(-2.91)
β_5	0.947	1.471	1.151	-2.001	-0.048	-1.654
	(0.57)	(0.72)	(0.60)	(-1.26)	(-0.35)	(-0.51)
β_6	7.823***	9.538***	11.733***	35.001	1.427	-0.002
	(3.26)	(3.31)	(3.76)	(1.09)	(0.45)	(-1.42)
β_7	-0.002	-0.019	0.014	0.003	0.001	-0.497*
	(-0.06)	(-0.31)	(0.25)	(0.12)	(0.33)	(-1.72)
β_8	-5.685**	-2.011	-0.185	7.218***	0.599***	-0.235***
	(-2.31)	(-0.51)	(-0.05)	(3.3)	(2.57)	(-2.57)
β_9	-2.276**	-3.709**	-2.534*	1.62*	0.115	-0.016
	(-2.24)	(-2.37)	(-1.89)	(1.72)	(1.32)	(-0.1)
β_{10}	-0.009	0.026	0.003	0.002	-0.001	0.08***
	(-0.25)	(0.42)	(0.05)	(0.06)	(-0.27)	(5.84)

Table 9 shows the results of the panel error corrected model (4), estimated with cross-section weighted generalized least squares controlling for country-heterogeneity. The columns show the results considering different market dependent variables (market capitalization over the GDP -Mc_GDP-, value traded over the GDP -Vt_GDP-, turnover ratio, market flows, market return and market volatility). α_0 is the constant, β_1, β_2, β_3 and β_4 reveal the short-term influence of domestic equity pension fund assets over GDP (in logarithms), inflation, real interest rate and GDP growth on the different market variables, respectively; β_5 represents the E*CM* and measures the speed of convergence from short run to long run equilibrium; β_6, β_7, β_8 and β_9 display the long-term influence of domestic equity pension fund assets over GDP (in logarithms), inflation, real interest rate and GDP growth on the different market variables, respectively; and β_{10} is the total pension fund assets (in logarithms). Z-statistics are in parenthesis. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 10. Influence of domestic equity pension fund return on the stock market.

	Panel A: GLS estimation		Panel B: GLS estimation controlling for heterogeneity	
	Market return	Market volatility	Market return	Market volatility
α_0	-0.003	0.056***	-0.001	0.055***
	(-0.57)	(4.61)	(-0.18)	(4.67)
β_1	0.073***	-0.034***	0.076***	-0.034***
	(23.84)	(-4.39)	(28.43)	(-4.5)
β_2	-0.122**	0.2	-0.072	0.169
	(-2.08)	(1.35)	(-1.48)	(1.1)
β_3	-0.026	0.04	-0.025	0.019
	(-0.91)	(0.56)	(-1.02)	(0.26)
β_4	0.073	-0.365***	0.036	-0.36***
	(1.42)	(-2.8)	(0.84)	(-2.93)
β_5	-2.719	8.095**	-3.057	8.523**
	(-0.88)	(2.26)	(-1.09)	(2.47)
β_6	0.004	-0.015*	0.08***	-0.047***
	(1.17)	(-1.77)	(19.36)	(-4.02)
β_7	0.182***	-0.161	0.138**	-0.076
	(2.78)	(-0.97)	(2.52)	(-0.46)
β_8	0.018	-0.105	0.014	-0.134*
	(0.69)	(-1.58)	(0.64)	(-1.95)
β_9	-0.006	-0.07	-0.001	-0.118
	(-0.13)	(-0.57)	(-0.01)	(-1.03)

Table 10 shows the results of the panel error corrected model (9), estimated with cross-section weighted generalized least squares (panel A) and cross-section weighted generalized least squares controlling for country heterogeneity (panel B). The columns show the results considering market return and market volatility as market dependent variables. α_0 is the constant, β_1, β_2, β_3 and β_4 reveal the short-term influence of domestic equity pension fund return, inflation, real interest rate and GDP growth on the different market variables, respectively; β_5 represents the E*CM* and measures the speed of convergence from short run to long run equilibrium; β_6, β_7, β_8 and β_9 display the long-term influence of domestic equity pension fund return, inflation, real interest rate and GDP growth on the different market variables, respectively. Z-statistics are in parenthesis. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.