

Are defined contribution (DC) pension funds a stabilising factor in equity markets? Evidence from Chile, Italy, Mexico and Poland

We analyse the investment behaviour of the defined contribution (DC) pension fund sector in equity markets during and after the 2008–2009 financial crisis until the years 2014–2016 and here for Chile, Mexico, Poland, and Italy. We employ quarterly data on equity purchases and sales and on cash flow at the level of the whole pension sector.

Applied are the following methods: analysis of average quarterly transactions; scatter plot analysis of the relation between average quarterly net purchases and quarterly changes in asset value, a correlation analysis of average quarterly transactions in the equity market and its index values, regression analysis of average quarterly transactions in the equity market and its index values.

The results indicate that in Poland and Italy, pension funds behaved counter-cyclically, whereas in Chile there are some signs, although less statistically significant, of pro-cyclical behaviour. In the case of Mexico no conclusions could be drawn. The investment behaviour of pension funds might be influenced not only by their strategic decisions but also by other factors that are related to the institutional framework they operate within (e.g. a strategic asset allocation benchmark may induce pro-cyclicality).

Key words: financial stability, investments, pension funds, pension supervision, private pensions, pro-cyclicality

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Introduction

Pension funds are important institutional investors. The existing empirical research on pension funds' investment behaviour and their role in financial market stability indicates that pension funds tend to have a counter-cyclical investment behaviour rather than a pro-cyclical one (Table 1)¹; therefore contributing to more stable prices in the market during substantial price changes.

Table 1. Empirical evidence on pension funds' pro/counter-cyclical investment behaviour

Authors (year)	Country	Data	Findings
Y. Timmer (2018)	Germany	banks, investment funds, insurance companies and pension funds	counter-cyclical (insurance companies and pension funds), pro-cyclical (banks and investment companies)
COVIP (2009)	Italy	large pension funds	counter-cyclical
Bank of England (2014)	the United Kingdom	DB pension funds	counter-cyclical
D. Broeders, D. Chen <i>et al.</i> (2016)	the Netherlands	DB large occupational pension funds	counter-cyclical in the short term (rebalancing)
J. Gorter and J. Bikker (2013)	the Netherlands	DB pension funds	counter-cyclical
L. De Haan and J. Kakes (2011)	the Netherlands	pension funds, life insurers, and non-life insurers	counter-cyclical (insurers are not counter-cyclical)
J.A. Bikker, D. Broeders, J. de Dreu (2010)	the Netherlands	pension funds	counter-cyclical
D. Bams, P. Schotman, M. Tyagi (2016)	the U.S., Canada, Europe, Australia, and New Zealand	978 pension funds	counter-cyclical
B.A. Jones (2016)	the U.S., Canada, Europe, Australia, and New Zealand	pension funds and other institutional investors	pro-cyclical
P. Duijm and S. Bisschop (2015)	the Netherlands	pension funds and insurers	mixed (counter-cyclical on equity, pro-cyclical on sovereign bonds)

¹ See the detailed discussion of the subject literature in K.G. Park, D. Stańko, *Macro- and Micro-Dimensions of Supervision of Large Pension Funds*, IOPS Working Papers on Effective Pension Supervision No. 30, International Organisation of Pension Supervisors, 2017.

Authors (year)	Country	Data	Findings
D. Blake, L. Sarno, G. Zinna (2015)	the United Kingdom	DB pension funds	mixed (counter-cyclical mechanical rebalancing, pro-cyclical herding behaviour)
D. Graeme and M. Roberts-Sklar (2018)	the United Kingdom	DB occupational pension funds	mixed (pro-cyclical for funds supported by financially weaker corporate sponsors, and counter-cyclical for funds with financially stronger corporates)
OECD (2010)	selected OECD countries	pension funds	mixed (counter-cyclical in Italy, Norway, Poland, and Turkey, pro-cyclical in Spain, the U.S., Finland, and Portugal)

Source: K. Gook Park, D. Stańko, *Macro- and Micro-Dimensions of Supervision of Large Pension Funds*, IOPS Working Papers on Effective Pension Supervision No. 30, International Organisation of Pension Supervisors, 2017, p. 40, with authors' update

Most of the studies cited above analysed only a subset of the pension market and tended to focus on developed markets. Our contribution to the subject literature is that we analyse the effect of whole pension industry in Chile, Mexico, Poland, and Italy. It is worth emphasising that only these pension supervisors from the International Organisation of Pension Supervisors (IOPS) were able to provide us with transaction data granular enough to allow for a detailed analysis. The main purpose of the study is to investigate whether defined contribution (DC) pension funds from these jurisdictions, contributed to the stability of financial markets, in particular during the recent financial crisis. We also try to identify the conditions which may contribute to pension funds investment behaviour that would (de)stabilise equity markets.

Second section presents the data. The definitions and methodology are described in sections third and fourth. Section fifth contains the results and section sixth discusses possible institutional determinants of investment behaviour. The last section concludes.

Data

We analyse the investment behaviour of DC pension funds during and after the 2008–2009 Financial Crisis until 2014–2016 in four IOPS jurisdictions: Chile, Italy, Mexico, and Poland. The data, received from pension supervisory authorities, tracks the values of equity purchases and sales on a quarterly basis. The data also contains cash flows calculated at the level of the whole pension sector. The sample varies depending on data availability and covers the spans: 2008.01–2016.Q4 for Mexico, 2006.Q1–2014.Q4 for Italy, 2006.Q1–2015.Q4 for Poland, and 2006.Q1–2016.Q4 for Chile.

Definitions

For the use of this study we apply the following definitions. The first approach is to compare the direction of funds' transactions with the direction of price changes. We define that funds act pro-cyclically when they are buying assets in a rising market and selling in a falling market. Such strategies could exacerbate price movements in financial markets. Funds act counter-cyclically when they are selling assets in a rising market and buying in a falling market. Such strategies could stabilise price movements in financial markets.² The second approach compares the relative size of pension funds' transactions during a particular period with the relative size of transactions in the previous period (see Figure 5). Funds may change their propensity for buying (selling) to adjust to the changing market conditions and to allow for a rebalancing of their asset holdings. For example, in a rising market a fund may continue purchasing a particular class of assets but decrease (*i.e.* be somehow counter-cyclical) or to increase (be pro-cyclical) the relative size of its net purchases of the asset compared to the total investments in all assets during the said period. Alternatively, pension funds may rebalance their asset allocation by simply refraining from taking any action, *i.e.* they may hold on their position without making additional investment or disinvestment.

Net purchase of equities is defined as the difference between the amount of equity purchased and the amount of equity sold during each quarter, while net new investments as a sum of the net purchases of all asset classes during each quarter. Net new investments can also be viewed as the net cash flow to a pension fund during the particular period, *i.e.* a difference between all inflows (the contributions of existing members and the incoming assets of new members) and all outflows (the retirement benefits to existing members and the transfer of assets of departing members).

Methodology

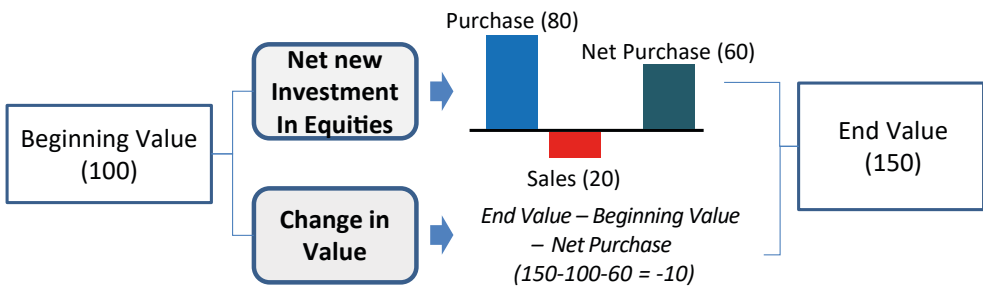
We delimited the periods based on the history of the MSCI International World Index Price and have used four methods to analyse equity investment by pension funds for the following four sub-periods: pre-crisis (until Q2.2007), crisis (Q3.2007–Q1.2009), recovery (Q2.2009–Q4.2009), and post-crisis (2010–2016). First, we analysed the average quarterly transactions for each sub-period. Second, we used a scatter plot analysis of the relation between average quarterly net purchases and quarterly changes. Third, we applied a correlation analysis of the average quarterly transactions in the equity market and its index values. Finally, we used regression analysis of the average quarterly transactions in the equity market and its index values.

² D. Blake, L. Sarno, G. Zinna, *The Market for Lemmings: The Investment Behavior of Pension Funds*, Pension Institution Discussion Paper, 2015, p. 20.

Analysis of average quarterly transactions by periods

When analysing the investment position in a particular asset class, one needs to take into account two effects. The value of such a position can change due to price changes in the financial market or due to transactions concluded by the pension fund investment manager. Usually, the final result is due to both effects at the same time. Figure 1 explains the methodology used to disentangle the price and the transaction effects. Let us assume that a pension fund A invests in equity and that at the beginning of the quarter it has 100 euros invested. If at the end of the quarter the value of the position increases to 150 euros, this can be attributed to different factors: 1) the fact that some equity is bought and sold (“net new investments in equities”), and/or 2) the changes in equity prices (“change in value”). In our example, if the fund A purchased new equity for 80 euros and sold the other for 20, the new investments in equities (net purchase) will amount to 60 euros (+80–20) which in result makes the imputed change in value position to be minus 10 euros.

Figure 1. Transaction effect (net new investments) vs. price effect (change in value): an illustration



Source: authors

By finding net new investments of pension funds in each sample period, we can identify the investment behaviour of pension funds, *i.e.* to what extent the changes in the portfolio are related to exogenous price changes and to what extent to pension fund managers’ investment decisions. More specifically, by comparing their investments in risky assets during and after the Crisis, we can see whether pension funds stabilise or destabilise the market.

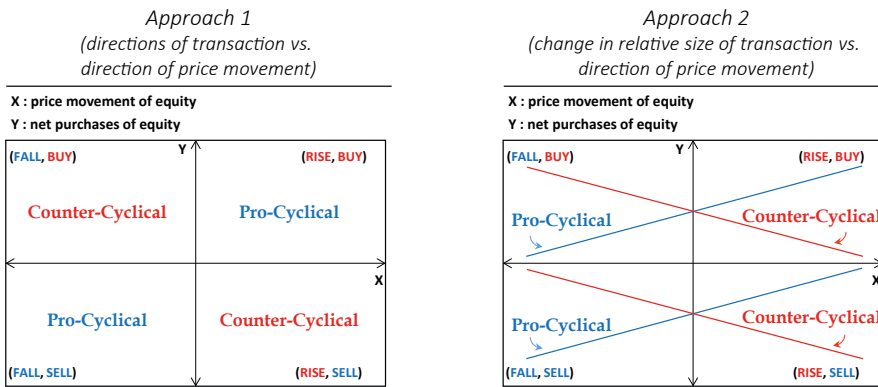
Scatter plot analysis

We compare the transaction effect and price effect on a quarterly basis (X: changes in equity value, Y: net purchases of equity). Net purchases of equity and changes in the equity value were transformed to relative figures to obtain standardised results.³

³ Net purchases (%) = Net purchases ÷ {(Beginning amount + Ending amount) ÷ 2};
Change in value (%) = Change in value ÷ {(Beginning amount + Ending amount) ÷ 2}.

In this analysis, one can intuitively interpret pension funds' investment behaviour during price movements (Figure 2). Applying the first approach of analysing the direction of price changes and transactions, we can conclude that if data points are located mostly in the first and third quadrants, pension funds are pro-cyclical since it means that pension funds are buying when price are rising, and selling when price are falling (counter-cyclical if the data are located mostly in the second and fourth quadrants). The second approach compares the relative size of transactions during and before the analysed period. If data points are moving with a positive (negative) trend line from the second to first quadrant or from the third to fourth quadrant, then pension funds are considered pro-cyclical as they increase the propensity for buying when the price are rising (counter-cyclical if the data points are moving with a negative trend line).

Figure 2. Illustration of how pension funds' investment behaviour could be defined



Source: authors

Correlation analysis

We use correlations between domestic stock market returns and net purchases of domestic equity.⁴ Net purchases are expressed in two different ways: as net purchases of domestic equity versus total net new investments or as absolute values of net purchases of domestic equity.

Regression analysis

We analyse domestic equity investments⁵ with two measures of risky investment: net purchases of domestic equity relative to total net new investment (Model 1) and the absolute value of net purchases of domestic equities (Model 2).⁶ Explanatory variables

4 The correlation analysis results for foreign equities are available on request (IOPS, dariusz.stanko@gmail.com).

5 The regression analysis results for foreign equities are available on request (IOPS, dariusz.stanko@gmail.com).

6 Models with lagged (by one quarter) returns were also tested. However, they provide no significant results. Moreover, with quarterly data it seems very unlikely that pension fund managers would be reacting to stock market changes with such a delay.

include: domestic stock index returns, MSCI returns, a change in the risk-free rate, a change in term premium (calculated as the difference between the representative domestic government bond yield and short-term risk-free rate), a change in credit spread (calculated as the difference between the representative domestic corporate bond yield and representative government bond yield), a change in foreign exchange rate and the GDP growth rate. For Model 2, we have transformed the dependant variable using a standardisation method⁷ to scale down its values.

Next, to investigate solely whether pension funds revealed pro- or counter-cyclical investment behaviour in domestic equity markets, we run a single regression model where stock index returns were the only explanatory variable.⁸

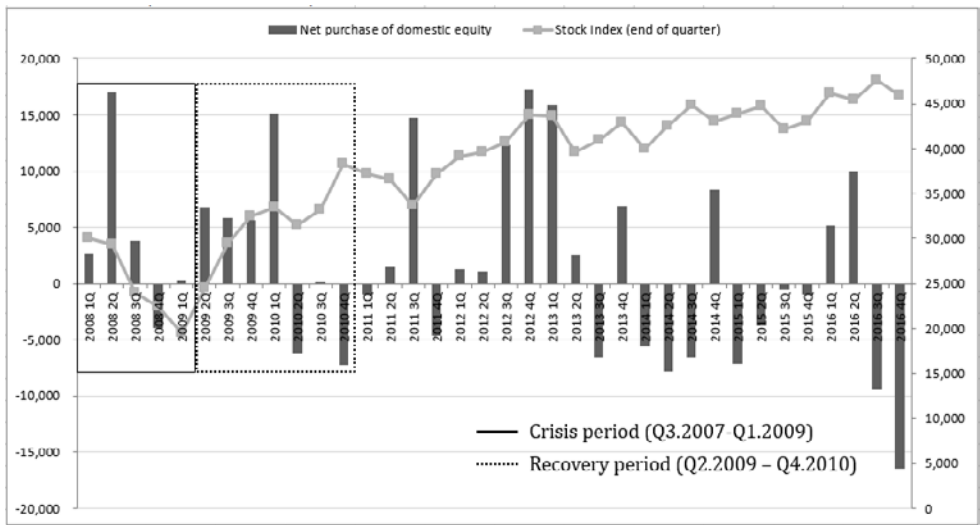
Results

Characteristics of pension funds' equity transactions

Figure 3 shows pension funds' net purchases of domestic equities compared with the representative stock indices in Mexico, Poland, and Chile. For Italy, due to data limitation we compared funds' net purchases of total equities and the representative international MSCI World Equity stock index. In three countries it is not easy to find any noticeable graphical relationship between the market performance and funds' purchases. Only in Chile, can one observe consecutive negative net purchases of domestic equities during 2008.

Figure 3. Net purchases of domestic equity vs. stock indices

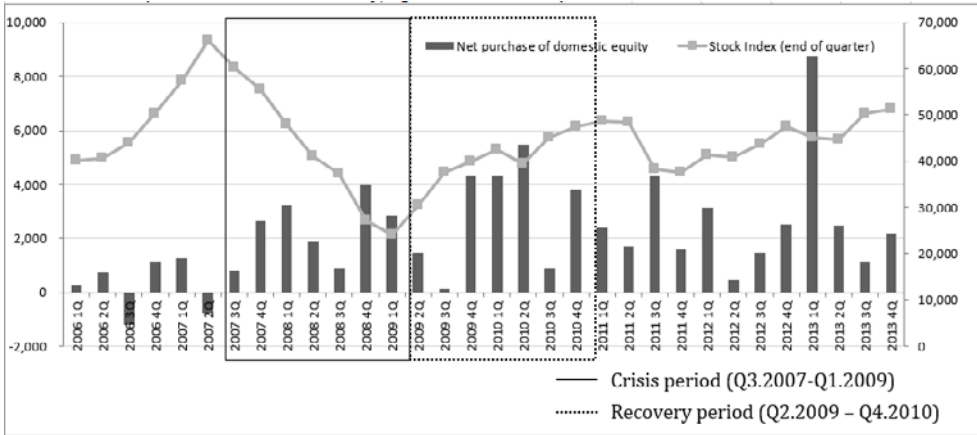
Panel A. Mexico (left axis: million Mexican Peso, right axis: IPC MEXBOL index)



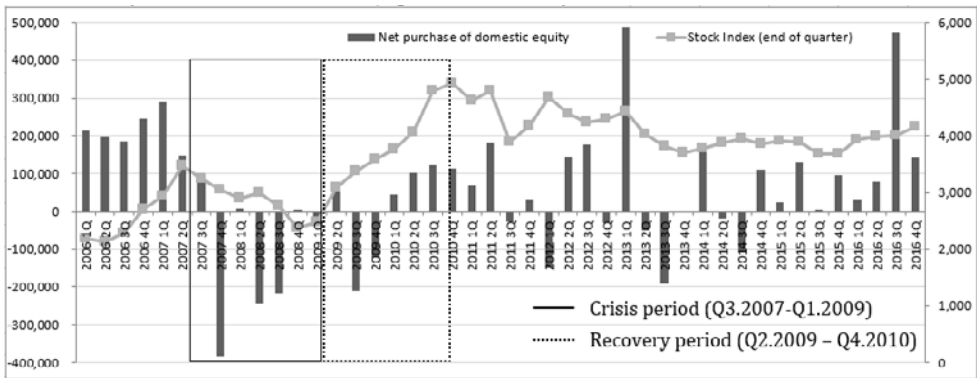
⁷ $x_{new} = \frac{x - \mu}{\sigma}$.

⁸ We also conducted several multiple regressions whose results are available on request (IOPS, dariusz.stanko@gmail.com).

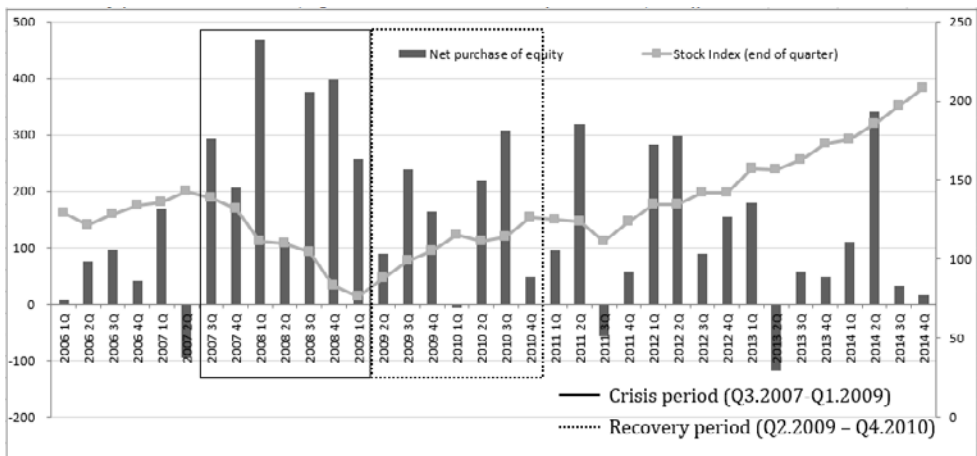
Panel B. Poland (left axis: million Polish Zloty, right axis: WIG index)



Panel C. Chile (left axis: million Chilean Peso, right axis: IPSA index)



Panel D. Italy (left axis: million Euro, right axis: MSCI World Index [Total return, EUR])



Note: The graph for Poland does not show transactions after 2013 when a structural change in the system occurred.

Source: IOPS

Table 2 provides some conjectures on the investment behaviour by pension funds in equity markets during and immediately after the Crisis of 2008. It must be emphasized that these conjectures are based on the average values: each being calculated for a particular sub-period (e.g. Crisis, recovery), where the values themselves are based on the average volumes of transactions for several quarters that make up each sub-period. Therefore, it may be the case that within each quarter under analysis, pension funds actually displayed different behaviour. In next subsections we use each individual quarterly data for a scatter plot, and correlation analyses.

A counter-cyclical behaviour during the Crisis can be found in domestic equity markets for Mexican and Polish pension funds and in foreign markets for Chilean and Italian funds. Pro-cyclical behaviour during the Crisis can be noted in Chile for domestic equity markets and Mexico for foreign markets. The investment behaviour of pension funds during the recovery period differs depending on the approach we apply. All jurisdictions revealed pro-cyclical behaviour with approach 1 analysing the direction of transactions, but according to approach 2 which looks at the relative size of transactions, dealings in Mexican domestic equity, Chilean and Italian foreign equities are rather counter-cyclical.

Table 2. Nature of transactions of pension funds in equity markets

Jurisdiction	Approach 1 (direction of transactions)				Approach 2 (relative size of transactions)			
	domestic equities		foreign equities		domestic equities		foreign equities	
	crisis	recovery	crisis	recovery	crisis	recovery	crisis	recovery
Mexico	-	+	+	+	N/A	[-]	N/A	+
Poland	-	+	(-)	(+)	-	+	[+]	[+]
Chile	+	(+)	-	+	+	+	-	(-)
Italy ^a	N/A	N/A	-	+	N/A	N/A	-	-

Notes: +: pro-cyclical investment behaviour.

-: counter-cyclical investment behaviour.

(): weak effect because of negligible average quarterly net investments (< 1% of total quarterly new investments).

[]: weak effect because of similar propensity (< 5% percentage of net purchases in total new investments).

N/A: no data on before crisis period for Mexico and domestic equities for Italy.

^a Most equity investment in Italy related to foreign equities.

Source: authors' analysis

Scatter plot analysis

Figure 4 depicts a scatter plot of the imputed change in value of domestic equity (%) and the reported net purchase of domestic equity (%). Since the scatter plot does not show the passage of time, we also present, as a complementary measure, a bar graph that indicates the temporal changes of these two variables. The variable “total equity” was used instead of “domestic equity” in the case of Italy due to data limitations. For Mexico, Poland, and Chile, the same analysis was performed for foreign equity as well; the conclusions are similar.⁹

⁹ Results are not presented here but are available on request (IOPS, dariusz.stanko@gmail.com).

The scatter plot analysis reveals that pension funds showed counter-cyclical behaviour in Poland (mainly in the domestic market) and Italy (mainly in foreign markets). On the other hand, Chilean funds showed pro-cyclical behaviour in both domestic and foreign equity markets. No strong evidence was observed in the case of Mexico.

In Poland, funds were net buyers most of the time. A bar graph confirms that they were net buyers not only when prices were falling but also when rising. Therefore, we need to apply the second approach to pinpoint whether pension funds acted pro-cyclically or counter-cyclically. We observe a stronger negative and statistically significant trend line suggesting that Polish funds lowered their propensity for net purchases when equity prices were rising. This is a sign of counter-cyclicality according to the description explained in Figure 2.

In Chile the largest group (45% or 20 quarters) of data points is concentrated in the first quadrant, indicating funds were buying equities when equity prices were rising. As a result, quite a clear positive trend line, one statistically significant only at a level of 10%, is observed. This suggests a pro-cyclicality. Similar results are shown for foreign equities with an even stronger positive trend line at 5% level.

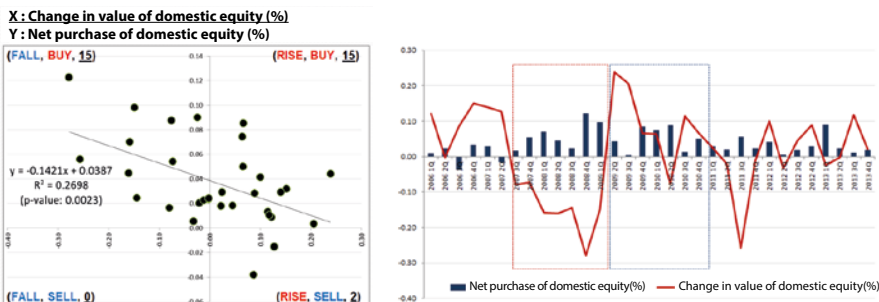
The results for Italy are very similar to Poland. The data points are mostly concentrated in the first and fourth quadrants (32 out of 36) and reveal a strong, statistically significant, negative trend line. This suggests that Italian pension funds acted counter-cyclically.

Figure 4. Scatter plot analysis for domestic equity

Panel A. Mexico



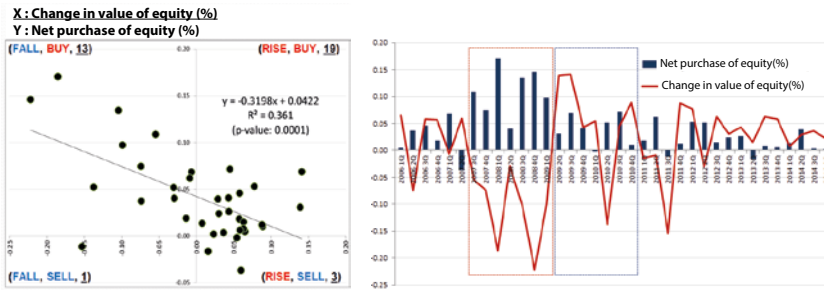
Panel B. Poland



Panel C. Chile



Panel D. Italy



Source: authors' analysis

Correlation analysis

Table 3 shows correlations between domestic stock market returns and net purchases of domestic equity.¹⁰ Net purchases are expressed in two different ways: as net purchases of domestic equity versus total net new investments or as the absolute values of net purchases of domestic equity. Only in Poland and Italy were the coefficients statistically significant and a negative signalling of a counter-cyclical investment behaviour in the domestic stock market. In Poland, values are negative for the total period and for the recovery. Correlations for Italy are negative for the total period, the Crisis and the recovery periods. The last two values are significant in the model that uses relative purchases.

The above two findings support conclusions from section *Characteristics of pension funds' equity transactions* on the counter-cyclical behaviour by Polish funds in their domestic equity market and by Italian funds in foreign equity markets during the Crisis period. In addition, correlation results are in line with the results obtained from scatter plot analysis that also indicates a counter-cyclical behaviour by Polish funds in domestic, and Italian funds in foreign equity markets.¹¹

¹⁰ The correlation analysis results for foreign equities are available on request (IOPS, dariusz.stanko@gmail.com).

¹¹ Various regression models, not reported here, strongly signalled a counter-cyclical behaviour for Poland (domestic equities) and Italy (foreign equities), and pro-cyclical investment for Chile (strongly for foreign, weakly for domestic equities).

Table 3. Correlation coefficients between domestic stock index returns and net purchases of domestic equity

	Domestic stock index return and	
	net purchases of domestic equity relative to total net new investment (%)	absolute value of net purchases of domestic equity (%)
Mexico (Q1.2008–Q4.2016)	5.9	2.1
- pre-crisis	N/A	N/A
- crisis (Q1.2008–Q1.2009)	35.3	26.2
- recovery (Q2.2009–Q4.2010)	43.6	21.3
- post-crisis (Q1.2011–Q4.2016)	-5.0	-8.9
Poland (Q1.2006–Q4.2013)	-22.8	-43.6*
- pre-crisis (Q1.2006–Q2.2007)	16.0	5.3
- crisis (Q3.2007–Q1.2009)	-30.3	-70.1
- recovery (Q2.2009–Q4.2010)	-77.5*	-90.5**
- post-crisis (Q1.2011–Q4.2013)	-33.6	-40.8
Chile (Q1.2006–Q4.2016)	28.8	22.9
- pre-crisis (Q1.2006–Q2.2007)	10.6	-6.1
- crisis (Q3.2007–Q1.2009)	-13.7	-14.2
- recovery (Q2.2009–Q4.2010)	29.7	20.6
- post-crisis (Q1.2011–Q4.2016)	5.2	10.0
Italy (Q1.2006–Q4.2014) ^a	-40.6*	-42.8**
- pre-crisis (Q1.2006–Q2.2007)	-47.1	-33.7
- crisis (Q3.2007–Q1.2009)	-85.9*	-74.7
- recovery (Q2.2009–Q4.2010)	-81.2*	-52.6
- post-crisis (Q1.2011–Q4.2016)	17.0	20.5

Notes: * Denotes a statistical significance at 5% of the critical level.

** Denotes a statistical significance at 1% of the critical level.

^a Due to a lack of data, we have used total equity investments instead of domestic equity investments for Italy.

Source: authors' analysis

Regression analysis

The results (Table 4) vary by jurisdictions possibly due to differences in financial market characteristics and pension sectors' institutional structure. Model 2 demonstrates a better fit than Model 1 in terms of R-squared and Adjusted R-squared metrics.

Table 4. Determinants of pension funds domestic equity investment

Explanatory variables	Mexico		Poland		Chile		Italy	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	coefficient	coefficient	coefficient	coefficient	coefficient	coefficient	coefficient	coefficient
Intercept for positive stock index returns	0.05260	-0.08560	0.08084	0.60770	0.00080	0.09220	0.11530	-0.71180*
Intercept for negative stock index returns	0.28890	0.62570	0.16130	0.48500	0.02380	0.27410	0.40300**	0.52240
Positive stock index returns	0.66790	1.78240	-0.68950	-8.06800**	0.33610	2.14270	-4.57290	-4.85010
Negative stock index returns	2.41480	7.45820	-1.22080	-6.14460	0.56080	9.32140	-3.47310	-8.48460
MSCI returns	-1.05940	-5.30400	1.77080	7.25000	-0.02630	0.04440	4.36800	10.30310
Change in risk-free rate	-26.26320	-87.29000	9.64340	3.82230	-2.38690	-6.38230	-30.21000**	-143.10000*
Change in term premium ^a	-9.22220	-30.28090	N/A	N/A	-5.16640	-90.69600*	-18.45790	-131.30000**
Change in credit premium ^a	15.80210	92.02970	N/A	N/A	-3.32820	-131.40600	-2.66420	-18.07130
Change in foreign exchange rate	-1.66290	-8.30340	2.25400	3.82230	0.12130	1.33910	-5.14510	-2.17230
GDP growth rate	1.04270	5.80770	5.41390	-28.37000*	-0.12060	-3.63950	10.53000	-18.93230
R-squared	0.13570	0.20990	0.09860	0.44400	0.18540	0.24890	0.50070	0.50170
Adjusted R-squared	-0.16350	-0.06370	-0.16430	0.28180	-0.03020	0.05010	0.32790	0.32920
#observations	36		32		44		36	

Notes: The HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance method was applied.

* Denotes a statistical significance at 5% of the critical level.

** Denotes a statistical significance at 1% of the critical level.

^a No data were available for “Change in term premium” and “Change in credit premium” in Poland.

Source: authors’ analysis

Notwithstanding, the results do not show any relation between investment decisions by pension funds and stock returns. The only exception is Poland (Model 2) where the positive stock returns variable is statistically significant. Model 2 for Poland suggests that pension managers are lowering the amount of net equity purchases when stock index increases. It shows also a negative relationship between absolute net purchases and GDP growth. The same model for Chile and Italy indicates a reverse relationship between changes in term premium (*i.e.* the yield of government bonds net of the risk-free rate) and the absolute value of net equity purchases.

To investigate solely whether pension funds revealed pro- or counter-cyclical investment behaviour in domestic equity markets, we ran a single regression model where stock index returns was the only explanatory variable (Table 5). The results signal a counter-cyclical behaviour for Poland (domestic equities) and Italy (foreign equities). In Chile, one may speculate that the funds acted pro-cyclically; however, this finding (for Model 1) is statistically significant at 7% level.¹²

Table 5. Single regression; pension funds domestic equity investment

Explanatory variables	Mexico		Poland		Chile		Italy	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	coefficient		coefficient		coefficient		coefficient	
Intercept	0.0962	-0.0039	0.2528*	0.0671	0.0072	-0.0549	0.2002**	0.0974
Stock index returns	0.2374	0.2474	-1.0987*	-3.5340**	0.1924	2.6585	-1.1374*	-5.5670*
R-squared	0.0035	0.0005	0.0520	0.1904	0.0829	0.0522	0.1645	0.1835
Adjusted R-squared	-0.0258	-0.0289	0.0204	0.1635	0.0611	0.0297	0.1399	0.1595
#observations	36		32		44		36	

Notes: HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance method was applied.

* Denotes a statistical significance at 5% of the critical level.

** Denotes a statistical significance at 1% of the critical level.

Source: authors' analysis

Institutional determinants of pension funds' investment behaviour

While pension funds may follow general strategic asset allocation policies (*e.g.* to maintain a fixed percentage of assets in equities) which may result in an anti-cyclical pattern of their transactions, there may be other factors that also influence their decisions.

¹² The statistical significance may be weak because of the existence of multifunds, given that since 2008 Funds E have been allowed to invest in equities. (Information from the Superintendence of Pensions, Chile).

The institutional framework in a jurisdiction can have a significant impact on the way pension funds invest.

In Italy, the actual asset allocation of pension funds is expected to diverge from the strategic asset allocation (SAA), determined by the benchmark, but only up to a certain point. The deviation boundaries, set up in a fund's internal rules and the Statement of Investment Policy Principles, are usually defined in terms of tracking error volatility with respect to the benchmark portfolio, and are consistent with the SAA. Therefore, the strategic asset allocation benchmarks act as a binding commitment for Italian pension funds and imply almost a mechanical rebalancing of their investments in response to changes in portfolios' asset prices. This reduces the degree of divergence from the SAA. Other things being equal, funds buy asset classes which experience falls in prices and sell asset classes whose prices increase. The asset allocation during the sample period in Italy was very stable regardless of the situation in the markets; the standard deviation of asset allocation in shares for Italian pension funds (2.2%) was only half that of peers in other jurisdictions (Mexico: 4.8%, Poland: 5.0%, Chile: 5.9%).

Another institutional stricture is the minimum required rate of return, present in Chile and, until September 2013, in Poland. The required minimum is relative and depends on the average return of all funds of the same type. Both in Chile and Poland, an administrator of the fund with a rate of return lower than the minimum is/was obliged to cover the difference. Obviously, this arrangement influenced the investment behaviour of pension fund managers, which manifested itself as increased herding.

In Chile and Mexico pension fund members can choose from a couple of investment strategies that correspond to their age. As a result, the investment behaviour under study may be triggered by the combined behaviour of pension fund managers and pension fund members.

Conclusions

Table 6 summarises the main findings. In Poland and Italy, pension funds behaved counter-cyclically, whereas in Chile there are some signs, although less statistically significant, of a pro-cyclical behaviour. In the case of Mexico no conclusions could be drawn.

The investment behaviour of pension funds might be influenced not only by their strategic decisions but also by other factors that are related to the institutional framework they operate in. Pension funds tend to be stabilising if:

- the pension system is young (*i.e.* contributions exceed outflows so there is no liquidity problem for pension managers),
- the system is moved by some sort of asset allocation benchmark (as in Italy) or peer-based underperformance penalties (the case for Poland until recently),

- the members cannot switch their investment policy (so they cannot withdraw their savings from equity funds to conservative funds in the case of crisis) or where they have such choice but are properly informed (so they do not realise losses; the case of Chile after the first stage of the Crisis).

Table 6. Pension funds equity investment in the analysed countries: a summary

Jurisdiction /method	Transaction analysis (crisis)	Scatter plot analysis	Correlation analysis	Single regression analysis
		(whole period)		
domestic equity				
Mexico	continue buying counter-cyclical	?	?	?
Poland	continue buying counter-cyclical	negative trend line counter-cyclical	negative sign counter-cyclical	negative sign counter-cyclical
Chile	sell pro-cyclical	weak positive trend line (at 9%) pro-cyclical (?)	weak positive sign (at 6%) pro-cyclical (?)	weak positive sign (at 7%) pro-cyclical (?)
foreign equity (the majority of Italian pension funds' investments)				
Italy	continue buying counter-cyclical	negative trend line counter-cyclical	negative sign counter-cyclical	negative sign counter-cyclical

* Note: Question mark (?) denotes findings not statistically significant (more than 5%).

Source: authors' analysis

Our study indicates that DC pension funds do not always stabilize financial markets, but they behave counter-cyclically in certain circumstances such as those indicated above. As a result, it seems that with the ageing of pension systems and/or an increase of investments in other asset classes (such as alternatives, real estate *etc.*), the stabilising effect on domestic equities will be diminishing. Where pension fund members can choose between investment portfolios, they should be given proper information by government and regulators so as to avoid panic during market downturns. The introduction of an asset allocation benchmark may contribute to more stable investment behaviour by pension funds.

Making policy recommendations may be difficult, because the pro-cyclicality or counter-cyclicality of pension funds should not be subject to valuation. This paper has found that the presence of some strategic asset allocation index (such as in Italy) may help stabilising financial markets. Counter-cyclical behaviour by institutional investors seems to be good for the stability of financial markets and the economy in the long-run. However, it is difficult to conclude that a particular benchmark or investment behaviour is beneficial for pension fund members, at least *ex-ante*, and thus should be

promoted by supervisors or policy makers. Investment decisions by pension funds should be governed solely by the interest of their members and correspond to the specific local circumstances.¹³

¹³ For instance, when a structural vulnerability of the market occurs the governing body of a pension fund may become pro-cyclical so as to prevent losses to pension fund members in line with its legal mandate.

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Czy system emerytalny typu DC (*defined contribution*) pełni stabilizującą rolę na rynkach giełd papierów wartościowych? Ekspozycja dowodów pochodzących z Chile, Włoch, Meksyku oraz Polski

W artykule analizowana jest aktywność inwestycyjna funduszy emerytalnych typu DC (*defined contribution*, zdefiniowanej składki) w Chile, Meksyku, Polsce oraz Włoszech zarówno w okresie kryzysu finansowego z lat 2008–2009, jak i w następujących po nim latach aż do okresu 2014–2016. W tym procesie posiłkujemy się danymi kwartalnymi dotyczącymi zakupów na giełdach oraz przepływów pieniężnych na poziomie ogólnosektorowym w sferze funduszy emerytalnych.

Użyto następujących metod: analiz średniej transakcji kwartalnych i wykresów punktowych przedstawiających zależności między średnimi cenami kupna po uwzględnieniu wszelkich obniżek a zmianami występującymi w danym kwartale, korelacyjnej analizy średniej transakcji kwartalnych na rynku giełdowym oraz wartości jego wskaźników cen, a także regresyjnej analizy średniej transakcji kwartalnych na rynku giełdowym oraz wartości jego wskaźników cen.

Wyniki wskazują, że w Polsce i we Włoszech fundusze emerytalne zachowywały się kontrcyklicznie (czyli stabilizująco), podczas gdy w odniesieniu do Chile istnieją pewne dowody, choć mniej istotne statystycznie, na występowanie procyklicznych zachowań inwestycyjnych. W przypadku Meksyku nie można było wysunąć żadnych wniosków. Zachowania inwestycyjne wspomnianych funduszy emerytalnych mogą pozostawać pod wpływem nie tylko decyzji strategicznych, lecz także innych czynników związanych z rozwiązaniami instytucjonalnymi, w których fundusze te działają (np. benchmark strategicznej alokacji aktywów może wywoływać działania procykliczne).

Słowa kluczowe: stabilność finansowa, inwestycje, fundusze emerytalne, nadzór emerytalny, prywatne emerytury, procykliczność