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The interaction among pension funds, saving rate and balance of payment

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Abstract

This study aims to explore the existence of causal relationship between pension funds and two macroeconomic key variables, namely balance of payments and saving rate for across OECD countries over the period 2001–2015. Employing a panel vector autoregression (PVAR) methodology, bi-directional Granger causal relationships are found between balance of payment, pension funds and saving rate. Results suggest that policymakers should take any possible economic impacts into account while making new regulations regarding pension funds.

Keywords: Saving rate, current account deficit, panel VAR, pension funds.

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1. Introduction

Increasing investments, one of the important factors that we need to realise the industrialisation and economic growth of the countries, is not a matter of quality and quality of the development funds. These funds, which are to be invested in investments in the finance sector, are very limited in terms of funding, and it is always possible to use the most profitable and most efficient means of obtaining funds from other sources. For this reason, there is a great need for the developed and deepened financial markets and the diversity of tools and institutions in these markets.

In the development of financial markets, the process of financial liberalisation plays an important role. The country, which has long been an extension of the economic crisis that began to take place in the 1970s, has faced a series of economic problems, showing that it is mostly debt repayment. Especially in the developing countries under the constraint of financing, they have been in the form of measures aimed at passing the mistakes presented in this process and the enrichment policies of the internal financiers. The main proposals for a policy that are expected to increase domestic resources or savings are for financial liberalisation based on the McKinnon (1973) and Shaw (1973) hypothesis, and in particular for the real interest rates to be abandoned. In the context of the McKinnon and Shaw hypothesis, it is argued that the liberalisation of the financial system will contribute to the development of financial markets, increase the savings rate in the economy, and thus, transfer more resources to productive investments, and ultimately, economic growth can be realised. In many developing countries, it was anticipated that at the beginning of the 1980s, domestic financiers would increase and real economic interest rates were gradually widened. Thus, in many developing countries, various economic liberalisation measures, including real interest rates were put into practice with the expectation that the domestic financing facilities would increase in the early 1980s, and financial development process has gained momentum in many countries of history.

Along with the financial liberalisation movement, significant changes occurred in the financial systems of developed and developing countries in the 1970s and 1980s. The amount of funds in circulation has increased significantly, the instruments in the market have diversified, new financial markets have been developed and the developments in technology and communication have facilitated the realisation of financial transactions at international level and at lower transaction costs.

In this fast-paced run through financial restructuring movements, many innovations have been announced in the world's financial markets, and these innovations have in particular secured a place in today's developed markets. From futures to options, Eurobonds from interest and currency swaps, a lot of new instruments that could be described as financial breakthroughs have been passed down, and thus, speeding up the development of money and capital markets.

One of the new financial instruments striking the financial development process is private pension funds. The main difference of private pension funds from many other financial innovations is that the purpose of the emergence is not directly related to the financial markets and they have been disappointed as a result of the proposal for the 1980s social security crises in many countries.

Private pension funds are a type of private financial intermediary that provides income during the period when employees do not work by collecting a certain portion of their savings during the working period under the name of 'contribution'. These institutions, which are mainly for social security purposes, obtain 'long-term' and 'large amounts' of funding from their participation contributions. On the other hand, these funds also fulfil an important financial intermediation function through the use of economic units and other financial intermediaries which is needed for the economy. Retirement funds are trying to support and broaden their contribution to the creation of effective alternatives in the provision of long-term funds needed in the economy, especially with tax advantages.

This study consists of five sections with an introduction. In the second section, a literature search was done. Data and methodology section was made in Section 3 and analytical results were interpreted in Section 4 and concluded with the political implications in the last section.

2. Literature

Recently, most countries, taking the financial sustainability of pensions into account, have started to reduce the pensions. Hence, pension funds have become important institutional investors in financial markets and their value have increased. The uprising values of pension funds lead to analyse the economic impacts of pension funds. In this regard, many studies focused on the impact of pension funds on the capital markets and the development of economic growth. The studies on the interaction between pension's funds and financial market development mostly suggest that pension funds positively affect capital markets (Cosmin, Marius Cristian, & Miloş, 2015) (Yılmaz & Metin, 2014). In addition, many studies (Holzmann, 1997) (Davis & Hu, 2004)find that pension funds make a positive contribution to the economic growth. On the other hand, relatively fewer studies claim that pension funds negatively impact the economic growth (Funding of pensions and economic growth: are they really related?) .In of the most previous studies, (Holzmann, 1997) by using a data set from 1980 to 1994 in Chile, finds that pension funds have a positive effect on the economic growth by increasing the factor productivity, capital structure and decreasing the deformities in labour market. In another study (Davis & Hu, 2004) examined the effect of pension funds on the economic growth from 38 OECD countries by applying a panel data model and find a positive effect. Whereas, (Zandberg & Spierdijk, 2010) apply a dynamic regression model on 58 countries (including OECD countries) between 2001 and 2008 period and suggest that the interaction between pension funds and economic growth is not significant. Also, (Zandberg & Spierdijk, 2013) conduct a similar study on 54 countries which are not members of OECD for the period of 2001–2010 and observe that pension funds and economic growth have no interaction in the short run but they retrieve mixed result in the long run. However, with new observations and data, in the long run, they reveal the positive impact of pension funds on the economic growth. (M. Bijlsma, 2014)) study the impact of pension funds on the economic growth in 34 OECD countries and find a positive interaction between pension funds and the economic growth. Finally, (Farayibi, 2016) by using error correction model and regression analysis suggest that pensions that are financed have a positive effect on the economic growth in Nigeria for the period of 2005–2014.

3. Data and methodology

The panel data analysis included 23 OECD countries because country selection has been prioritised in countries with access to data in the 2001–2015-time period and the implementation is limited to 23 countries. The pension funds, balance of payment and saving rate used in the study were taken from the World Bank. All indicators are measured as a percentage of GDP.

3.1. Panel VAR

In this paper, we use a panel vector autoregression (PVAR) approach because it has several advantages over individual country VARs. First, we gain degrees of freedom by analysing a panel of countries. Further, we can better model the spillovers from one country to another, since the panel approach captures country-level heterogeneity.

The vector autoregressive (VAR) model system proposed by (Sims, 1980) as a critique of the system of simultaneous equations is used to reveal the interactions of variables considered to be in mutual relation with one another, and each variable in the model is explained by its own delayed values. This model is used frequently and is separated from the simultaneous equation system by this structure

because it gives dynamic relations between variables and does not need to distinguish between variables that are created by way of economic findings from being internal or external.

The PVAR model was created by combining the traditional VAR approach and panel data models (Inessa & Lea, 2006). From this perspective, it can be said that it has the advantages of both the PVAR model and the panel data model. The first study on the panel model is the study of (Douglas, Whitney, & Harvey, 1988).

In matrix notation, the PVAR model can be written as

$$Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 \ldots\ldots Y_{it-p+1}A_p + X_{it}B + u_i + e_{it} \quad (1)$$

whereY_{it} is *(kxk)* vector of independent variables,X_{it} is (1*xl*)vector of exogenous covariates and u_i and e_{it} are vectors of dependent variable-specific panel fixed-effects and idiosyncratic errors, respectively.

In the PVAR model, there are also past circuits of explanatory variables. For this reason, the intra-group transformation used to eliminate the stationary effects will cause the parameters to be deviated (Arellano & Stephen, 1991) so the orthogonal deviation can be used to eliminate the stationary effects (Konstantinos & Konstantinos, 2005). Since this transformation provides orthogonally between the transformed variables and the delayed dependent variables, the parameters that can be used as the lagged variables tool can be estimated with GMM (Manuel & Olympia, 1995). For this reason, this study applies a PVAR analysis based on GMM generated codes from Michael R.M. Abrigo and Inessa Love.

The correlations obtained from the estimation of PVAR models can reveal the relationship between the variable set discussed. The PVAR model requires three techniques in order to be used in a structural analysis. These techniques are the Granger-causality test, impact response analyses and variance decomposition.

3.2. Granger

In the analysis of time series, the test of the concept of causality among variables was first put forward by Granger. In the Granger-causality test, the relationship between the two variables is investigated. If the value of an existing y value is better predicted than the current value of the other variable (*x*) rather than the past values of the circuit, then from the x variable to the y variable, the existence of the causality relation can be mentioned.

The investigation of the causality relationship in panel data analysis is based on the Granger-causality logic. The model to be used for panel causality can be expressed in the following way:

$$y_{it} = \alpha_i + \sum_{k=1}^{k} \gamma^k y_{it-k} + \sum_{k=1}^{k} \beta^{(k)} x_{it-k} + \in_{it} \quad (2)$$

Here, α_i refers to a peculiar effect. γ^k and $\beta^{(k)}$ are assumed to be the same for all units.

3.3. Impulse response analysis

The VAR approach also allows for the use of impact response functions. The impulse-response functions reflect the effect of the 1% standard error of the random error terms on the present and future values of the internal variables. It is usually determined by variance decomposition which is the most influential variable on a macroeconomic magnitude. Whether or not this influential variable can be used as a policy tool is determined by impact response functions (Helmut & Helmut, 2009).

4. Empirical results

As indicated in the introduction part, our main hypothesis is that ratio of pension funds to GDP causes to an increase in the ratio of the balance of payments to GDP and saving rate. We employed the PVAR analysis to find that causal relationship. Our model has six steps respectively, unit-root test, lag length selection criteria, estimating the PVAR model, PVAR Granger causality and estimating impulse-response function.

Prior to estimate PVAR, we implement panel unit-root test to detect integration of three variables in our data as the first step of our model. Table 1 shows the panel unit-root test result for BOP, SR and PF. Results from the panel unit-root tests indicate that three variables involved in this study are stationary, namely, BOP, SR and PF at level.

Table1. Panel unit-root test–Levin-Lin-Chu (LLC)

	Levels	
Variables	Constant	Constant and Trend
BOP	−1.8170* (0.0346)	−5.599*** (0.00)
PF	−3.7191***(0.001	−6.289*** (0.000)
SR	−4.71 (0.000)	−5.249*** (0.00)

Note: *, ** indicates rejection of the null hypothesis of at 1% and 5%, levels of significance

The second step is selecting the lag length selection criteria. Following (Love, 2016), in order to select lag length criteria based on three model selection criteria by (Lu, 2001) and the overall coefficient of determination, the statistical results in Table 2 are obtained. This table shows that the first-order PVAR is the preferred model since this has the smallest MBIC, MAIC and MQIC. Based on multiple selection criteria, we fit the first order PVAR model instrumented by 1 lags for all included variables using GMM-style estimation.

As stated earlier in this paper, our empirical results are based on multiple causality tests between four variables. To test bidirectional causality test, we set two hypotheses as follows:

i. Pension funds Granger causes the balance of payment and vice versa
ii. Saving rate Granger causes the balance of payment and vice versa
iii. Pension funds Granger causes saving rate vice versa

To test the above hypothesis, we employ PVAR model based on the efficient GMM approach as the third step of our analysis after lag length selection criteria. We make three PVAR equations as follows:

$$BOP_{it} = \sum_{J=1}^{P} \alpha_{1j} BOP_{i,t-j} + \sum_{J=0}^{P} \beta_{1j} PF_{i,j-t} + \sum_{J=0}^{P} \gamma_1 SR_{i,t-J} + \varepsilon_{1it} \quad (1)$$

$$PF_{it} = \sum_{J=1}^{P} \alpha_{2j} PF_{i,t-j} + \sum_{J=0}^{P} \beta_{2j} SR_{i,j-t} + \sum_{J=0}^{P} \gamma_2 BOP_{i,t-j} + \varepsilon_{2it} \quad (2)$$

$$SR_{it} = \sum_{J=1}^{P} \alpha_{3j} SR_{i,t-j} + \sum_{J=0}^{P} \beta_{3j} BOP_{i,j-t} + \sum_{J=0}^{P} \gamma_3 PF_{i,t-j} + \varepsilon_{3it} \quad (3)$$

The estimation results for the above PVAR (1) equations model based on the efficient GMM approach are reported in Table 3. The estimation results for the balance of payment show that saving rate, pension funds are statistically significant and expected signs. That result supports our hypothesis which saving rate and pension funds are increasing the balance of payments (A pension fund is significant at %10 level).

Table 3. Estimation results—VAR (GMM) with lag (1)

Dep. Var	r.h.s VAR.	Coef.	Corr.S.E	Z	*P*. value
BOP	BOP***	0.0517	0.0022	23.11	0
BOP	SR***	0.0643	0.6430	10.01	0
BOP	PF**	0.020	0.0105	1.90	0.057
SR	BOP	0.0011	0.0007	1,48	0.140
SR	SR***	0.8970	0.0189	47.27	0
SR	PF***	−0.0181	0.009	−2.01	0.044
PF	BOP	0.0003	0.002	1,53	0.127
PF	SR***	0.0963	0.0167	5.76	0
PF	PF***	0.7552	0.0903	83.57	0

***Denote statistical significance at the 1% level

Next step is employing VAR Granger causality test. Table 4 presents the statistical result for the VAR Granger causality test. Based on these results, conclusions can be made on the Granger cause causality for each pair of variables. For example: note the following:

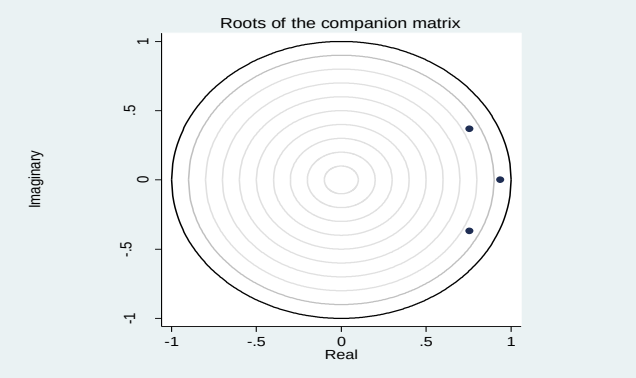
i. The joint effect of log SR (−1) and log PF (−1) on log BOP are significant, based on the chi-squared-statistic of 106.881 with df 1 and chi-squared-statistic of 18.887 with df 1, respectively so that the null hypothesis that saving rate and pension funds doesn't Granger-cause current account deficit can be rejected.
ii. The joint effect of log BOP (−1) and log PF (−1) on log SR are significant, based on the chi-squared-statistic of 28.212 with df 1 and chi-squared-statistic of 22.81 with df 1, respectively so that the null hypothesis that balance of payment and pension funds does not Granger-cause economic growth can be rejected.
iii. The joint effect of log BOP (−1) and log SR (−1) on log PF are significant, based on the chi-squared-statistic of 47.655 with df 1 and chi-squared-statistic of 123.806 with df 1, respectively so that the null hypothesis that balance of payment and saving rate does not Granger-cause pension funds can be rejected.

We conclude that Granger causality can either be uni-directional between the balance of payments and saving rate and pension funds vice versa.

Table 4. Granger-causality test

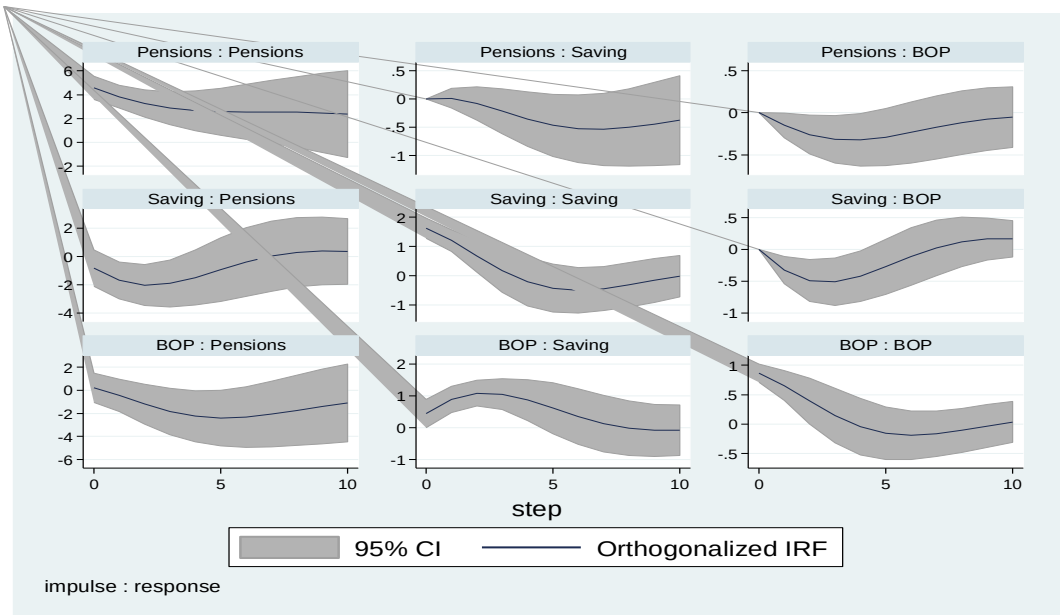
Equation\Excluded		Chi2	df	Prob>chi2
BOP	SR	106.881	1	0
	PF	18.887	1	0
	ALL	126.13	2	0
SR	BOP	28.212	1	0
	PF	22.81	1	0
	ALL	59.436	2	0
PF	BOP	47.655	1	0
	SR	123.806	1	0
	ALL	181.251	2	0

We first check the stability condition of the estimated panel VAR after then estimate impulse-response functions and forecast error variance decompositions. The resulting graph of eigenvalues at above confirms that the estimate is stable.



Graph 1. Roots of companion matrix

After performing to stability condition, we compute the impulse-response functions of the PVAR with confidence intervals computed using 200 Monte Carlo repetitions based on the estimated model. An impulse to saving rate and pension funds variables decreases to balance of payment at the short term but in the long run, both of them have a positive effect on the balance of payment. On the other side, it is noteworthy that the current shock disappears in the balance of payments in the long run.



Graph 2. Impulse-response

5. Conclusion

This study applied panel generalised method of the estimator for vector autoregression models PVAR with fixed individual effects to estimate causality between the balance of payments, saving rate and pension funds. The causal relationship is found between the balance of payments, pension funds and saving rate. Also, the study found that bidirectional Granger causality between the balance of payments, pension funds and saving rate.

With this study, the individual pension system (IPS) put into practice in order to overcome the internal savings deficits that hamper the macroeconomic balances of the countries and/or to eliminate future problems; the relationship between domestic savings rates and the current account

balance has been examined through panel causality analysis. Findings have shown that the IPS is effective in closing down the savings austerity and ensuring current account balance. The findings of the study show that policymakers' development of the IPS and the development of new measures to increase the saving rate are important for the macroeconomic context.

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