Brazilian Pension Funds Stability Report

June 2018

CONTENTS

TEAM

PREFACE

The Brazilian Pension Funds Stability Report (REP) is a semiannual publication of the Brazilian Pension Funds Authority - (Previc), which presents the overview of Pension Funds (PF), their recent evolution and perspectives in Brazil, focusing on the main risks and the measures that are being taken to mitigate them. This edition presents data regarding the second semester of 2017 and aims at providing a prospective risk analysis.

The stability of the pension funds industry is the ability to maintain the funding level, the soundness and the regular functioning of the system, understood as the management of the resources of the participants and the payment of the benefits due.

The REP presents general aspects to specific situations considered relevant, in order to provide an understanding of the risks from the existing macroeconomic environment. The analysis seeks to highlight the liquidity and solvency situation, as well as the profitability, focusing on the inherent risks of management activities of third-party pension resources, all under a prospective approach..

Chapter 1 named "Macroeconomic Environment" contemplates the analysis of the economic situation and its possible effects on the pension funds system. Chapter 2, "Pension Funds System Overview", analyzes the system solvency and liquidity, with details on the evolution of the funding level, as well as the inherent risks, with the use of specific solvency, liquidity and credit indicators. In addition, in the results section, there is a profitability analysis, comparing each type of plan with market benchmarks.

This edition also contains two boxes. The first one related to the recent regulatory changes, implemented and under implementation, that seek to improve the regulatory framework and strengthen the defense lines of the pension funds industry. The second one explains the methodology used to analyze profitability per plan.

EXECUTIVE SUMMARY

The Pension Fund System (PFS) showed a significant improvement in the period ended in December 2017. The aggregate deficit of R$ 52 billion at the end of 2016 reduced to approximately R$ 16 billion. The positive solvency dynamics is due to the gradual improvement of the economic activity and, mainly, the implementation of recovery plans, in the proxy amount of R$ 39 billion, especially those made by the Systemically Important Pension Funds Entities (ESI). Equally relevant was the enhancement of the regulatory framework, with the issuance of resolutions and normative instructions aimed at strengthening the lines of defense and governance.

- The international environment has shown signs of change in the benign environment, marked by low inflation and growth, which may affect emerging markets. Eventual turbulence may happen by rising interest rates in advanced economic countries, especially in the US, and by the outbreak of disputes and breaches of agreements that impact on international trade and the price of oil.

- In the domestic environment, the risks are associated with the low economic growth, the fiscal situation and elections, with effects on exchange rate volatility and asset prices.

- Notwithstanding the improvement, the solvency of the system still depends on the success of the recovery plans implementation in defined benefit (DB) schemes on the following years. Usually, it means requirements of greater contribution from the participants and sponsors. Any obstacles to the fulfillment of the recovery plans may imply problems of viability and continuity of plans, with consequent reflection on the solvency of the system.

- The liquidity risk of the system remains low. The system holds assets that are eligible to meet its liabilities in the short and medium terms . Plans with long-term liquidity ratio (ILA) lower than one are being subject to supervision actions to adopt corrective measures.

- The analysis of the potential losses of financial assets showed that credit risk remains not systemically relevant, despite the small deterioration in credit quality. However, there are still plans with highly expected increased losses, which suggest poor quality in asset selection, deficiencies in credit risk management or, in isolated cases, evidence of fraud in investment operations.

- The limits disclosed for interest rates[1], used as premise of actuarial interest rates from 2018, reflected the interest rates reduction. If the current NTN-B real interest rate levels are maintained constant, the upper limit of the band for the longer durations will tend to approach 5.5% in the next years.

- The system profitability showed satisfactory performance in 2017. The average yield of the system was 11.52%, for a reference rate of 7.49% (INPC[2] + 5.32% y/y). Both the ESI, with an average yield of approximately 11.92%, and the non-ESI, with an average yield of approximately 10.88%, obtained results higher than the referred reference rate.

- Notwithstanding the positive result, the scenario should remain challenging to obtain a return compatible with the actuarial liabilities. The maintenance of historically low interest rates will decrease the return on fixed income assets and it will increase the actuarial liability. In this environment, we observed movements of resource allocation to higher risk investments, and/or review of actuarial targets.

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1 Ordinance 363, of April 26, 2018

2 Calculated by the Brazilian Institute of Geography and Statistics – IBGE. In 2017, INPC reached 2.0669%. Available on http: / / www. portaldefinancas.com/inpc_ibge.htm.

1 Macroeconomic Environment

1.1. International Scenario[3]

Macroeconomic data show that the world growth cycle has intensified, based on: (i) positive inflationary perspectives, including in emerging countries; ii) less taxation in the USA; iii) a predictable timetable for ceasing unconditional monetary policies in advanced countries, especially by the Federal Reserve (Fed) ; and iv) less belligerent geopolitical context.

In this scenario, the world economy registers a growth estimation of 3.9% in 2018 and 2019, an increase of 0.3 percentage points in relation to the last REP scenario. Despite these positive conjunctions, there is some uncertainty, such as the resurgence of US protectionism and the consequent trade tensions with China, with increased volatility in financial markets, which become current risk factors .

For advanced economies, growth expectation is 2.3% in 2018 and 2.2% in 2019. However, this more severe expectation maybe relieved by a benign environment in those countries where, despite the recent increase in oil prices, wage mass and inflation remain under controlled with tendency with probability to stabilize or fall. The conjunction of these scenarios has raised the confidence of both consumers and business managers.

For emerging countries, almost all growth estimations have been revised upwards, driven primarily by the greater attractiveness in commodity market prices and the acceleration of their investment cycles.

As a result, aggregate projections for these countries grew to 4.9% and 5% in 2018 and 2019, respectively, in consonance with the positive scenario of inflationary control and world growth.

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3 Monthly Global Reports of the World Bank (July 2017) and World Economic Outlook Update of the International Monetary Fund (July 2017)

1.2 Domestic scenario[4]

Despite the growth rates estimations for the Gross Domestic Product (GDP) in 2018 being under review, the expectation of the positive trajectory started in 2017 remains after two consecutive years of recession.

The low interest rate, inflation under control, a record crop harvest, a resumption of household consumption and a cooling down in the annual retraction of the Gross Fixed Capital Formation (GFCF) contribute positively to this new cycle. Despite the positive environment, reflected in the confidence and recovery indicators, there are significant risks linked to the 2018 elections and the ever-present possibility of unpriced revisions in the interest rates of advanced economies.

On the other hand, the job market suggests improvements in line with market projections and with respect to seasonal conditions (first three months of the year). The unemployment rate for February 2018 was 13.1%. In relation to the actual average income and the actual income mass, the variations remained positive at the same level (1.8% and 3.75%, respectively) compared to March 2017.

Regarding the price level measured by the National Consumer Price Index (IPCA)[5] , the downward trend was below market consensus and the target pursued by the Brazilian Central Bank (BCB), reaching in the 12-month period, 2.76% in April 2018[6] . This scenario stimulated the policy of reducing the basic nominal interest rate of the economy, which currently stands at 6.50% per year[7] .

In this context, real short-term interest rates start to orbit less than 3.0% per year, not proportionally accompanied, however, by long-term interest rates. This discrepancy is of particular interest for the pension funds industry.

Graph 1: Interest Rate Curves

1 Year - Short Term   30 Years - Long Term

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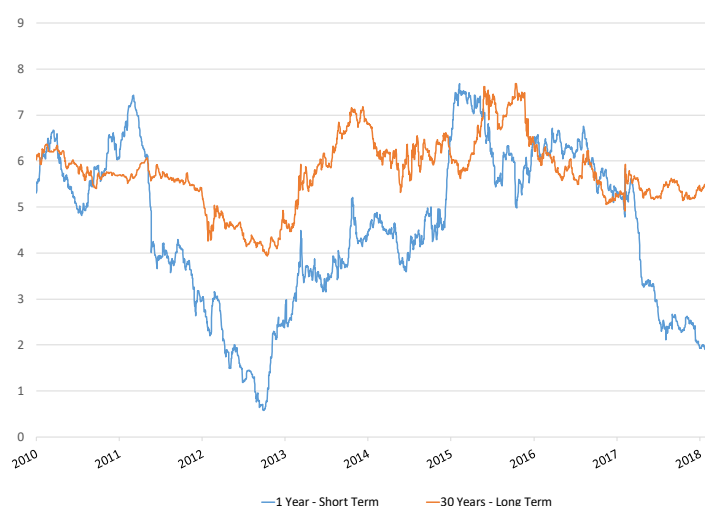
4 Data of June 2017 disclosed on Boletim Focus, IBGE Continous PNAD, the Independent Tax Institution and IPEADATA.

5 Calculated by the Brazilian Institute of Geography and Statistics

6 Inflation report – March 2018. Available on http://www.bcb.gov.br/htms/relinf/port/2018 /03/ri201803P.pdf

7 Copom Meeting of May 16, 2018.

The fiscal framework causes concern about the rigidity of compulsory budget expenditures, although benefited by the expectation of growth in tax revenue, proportional to the economy growth, and by the reduction of Selic rate, which reduces the cost of federal public debt. The approval of robust legislative reforms is less and less likely in 2018. In a scenario of greater fiscal deterioration, the public debt may bring even more damage.

2 Pension Funds System Overview

2.1 Introduction

The Pension Funds' investments are long-term savings that seek to maintain consumption patterns in the post-employment phase..

Pension Funds (PF) management seek to allocate resources in investments that maximize returns at certain risk levels.

The risks identified as inherent to the activities of resources management for pension purposes are liquidity, market, credit, operational, actuarial and asset and liability term management (ALM).

At the international level, resources managed by pension funds are important resources providers at the capital markets, especially for the long- term investments, and fundamental for the economic development of countries. The high amount of resources linked to pension funds in the world reflects this importance [8].

8 According to a study carried out by Willis Tower Watson – Global Pension Assets Study 2017 – the assets in plans linked to pension funds reached US$36.4 trillion in 2016 and corresponded to approximately 62% of the Domestic Product of 22 countries were the pension funds subject of the study are located.

2.2 System overview: December 2017

2.2.1 Big numbers

Throughout 2017, the pension system showed an increase in the number of plans and in the volume of resources managed, despite the reduction in the PF number [9].

In December 2017, the 306 PF in Brazil run R$ 842 billion out of 1,108 plans, being 323 Defined Benefit Plans (DB), 357 Variable Contribution Plans (VC) and 428 Defined Contribution Plans (DC). In quantitative terms, there was net expansion of only DC-type plans in the period, with the creation of six new plans (Graph 2).
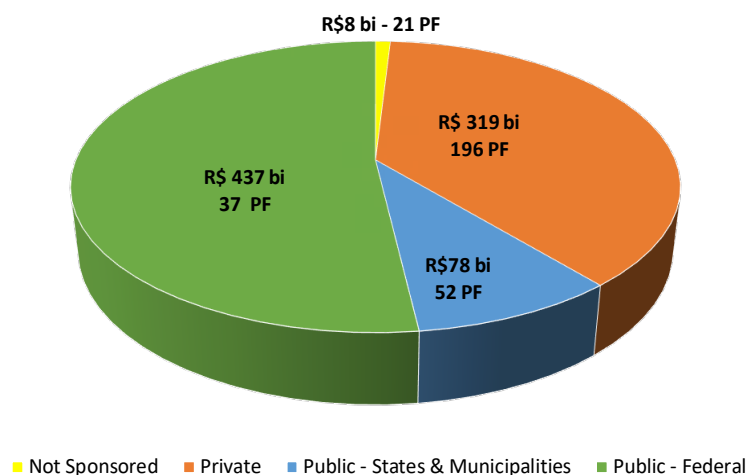
Regarding the distribution of resources by type of plans, DB hold R$ 536 billion, equivalent to 64% of total system assets, followed by VC plans, with R$ 193, and DC, with R$ 113 billion, equivalent to 13% of the total (Graph 3)[10].

Considering the distribution of PF by control, 61% of the total assets are hold by entities linked to companies and institutions owned by the federal, state or municipal government, 38% are run by private companies and 1% supported only by participants[11].
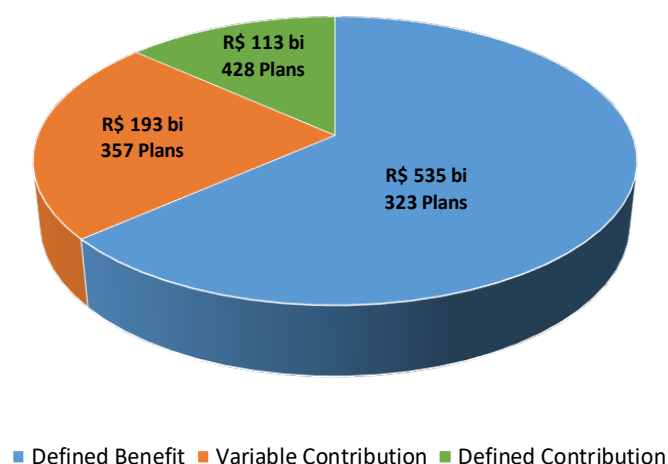
Of the 306 PF, seventeen are classified as systemically important entities (ESI)[12], because their operations are differentiated from the others in size, relevance and complexity. Overall, the ESI holds 62% of the total assets of the system (Graph 4).

In the increase number of participants, it is worth noting the recent significant public servants' adherence to the FUNPRESP of the Executive and Judiciary at the federal level, as well as the creation of benefit plans at the state level (Table 1).

Graph 2: Number of PF & Total Assets

R$8 bi - 21 PF
R$ 319 bi 196 PF
R$ 437 bi 37 PF
R$78 bi 52 PF

■ Not Sponsored ■ Private ■ Public - States & Municipalities ■ Public - Federal

Graph 3 - Types fo Plans

R$ 113 bi 428 Plans
R$ 193 bi 357 Plans
R$ 535 bi 323 Plans

■ Defined Benefit ■ Variable Contribution ■ Defined Contribution

Graph 4 ESI: Assets and Ownership

R$ 124 bi 6 ESI
R$ 27 bi 3 ESI
R$ 369 bi 8 ESI

■ Public - Federal ■ Public - States ■ Private

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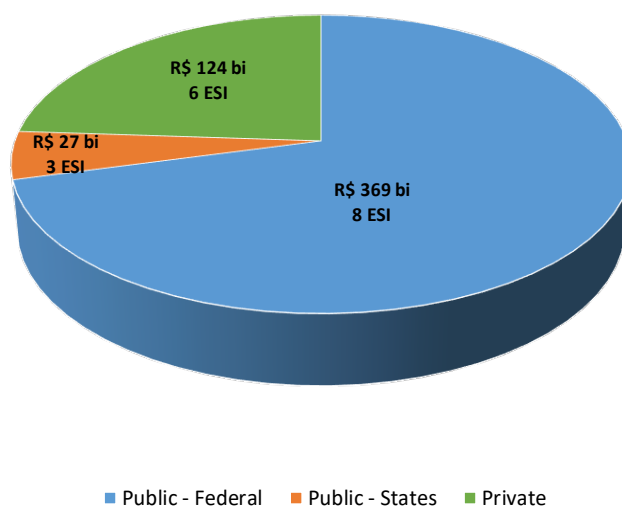
9 Canceled authorization of Sarah Prev and Kraft Prev.

10 According to the Quarterly Statistic Report – December 2017, available on http://www.previc.gov.br/central-de-conteudos/informe-estatistico/informes-de-2017/informeestatistico-4o-trim2017.pdf/view

11 Plans implemented by class associations, such as the Brazilian Bar Association (OAB)

12 Instruction Previc no. 5, of May 29, 2017, that establishes the conditions for Systemically Important Entities (ESI).

Chart 1: PF sponsored by states in activity

| State/Municipality	PF's Name	Activities since	EFPC's situation	Plans
São Paulo	SP-PREVCOM	March 23, of 2012	Operational	3
Rio de Janeiro	RJPREV	September 4, of 2013	Operational	1
Espírito Santo	PREVES	December 19, of 2013	Operational	2
Minas Gerais	PREVCOM-MG	September 19, of 2014	Operational	1
Bahia	PREVBAHIA	March 09, of 2016	Operational	1
Rio Grande do Sul	RS-PREV	April 26, of 2016	Operational	1
Santa Cartarina	SCPREV	May 02, of 2016	Operational	1
Goiás	PREVCOM-GO	May 02, of 2016	Operational	2
Alagoas			Under analysis	1
Pará			Under analysis	1
Curitiba-PR	CURITIBAPREV		Under analysis	1

2.2.2 Investments

Compared to December 2016, the total assets of the industry increased by 5.8%[13] , reaching R$ 842 billion, as a result of the incorporation of income earned from equities investments and fixed rate securities, mostly from federal public securities (TPF), net of obligations payments and of participants' contributions.

Despite the fact that they all had a major orientation for investments in TPF over the last years, reaching 64% of the total portfolio, including repurchase transactions, there are differences among the DB, DC and VC plan portfolios in the other classes of assets.

The DC and VC plans include investments in private securities, with a 15% and 11% interest in total investments, and in shares, with 7% and 10%, respectively (Graphs 6 and 7).

In the DB plans, the aggregate income composition is strongly impacted by the high concentration of the largest plan in Brazil in equity investments, which allocates a significant part (48%) in the stock market (Graph 8).

Excluding the assets of this plan, the investments of the other DB plans in equities are reduced to 7%, and other investments gain in relative importance such as federal government securities and repurchase agreements, private and real estate securities, which become 67%, 15 % and 6%, respectively, of total investments.

Graph 5: Portfolio Composition
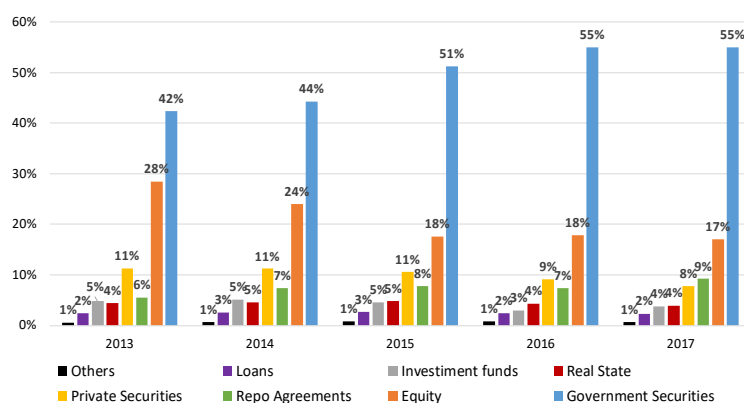
13 Growth from R$796 billion to R$842 billion.

This portfolio composition requires attention in the near future, especially for DB plans, as new investments may face compensation challenges against the actuarial discount rates applied.

Likewise, due to the maturity of the DB plans, the resources allocation in fixed assets should follow a declining trend. Between 2015 and 2017, the share of real estate decreased from 4.6% to 4.0% of total assets[14] .

Other assets that showed a reduction in participation in the last periods were Investment Fund in Finance Projects (FIP), falling from 2.8% to 1.52% between 2014 and 2017, and Investment Fund in Loans (FIDC), which decreased from 0.30% to 0.17% in the same period.

The low representativeness of investments abroad, in the approximate amount of R$ 2.5 billion at the end of 2017, is also noteworthy, corresponding to 0.3% of total assets.

With the interest rates stabilization at historically low level, benefit plans with potential deficits are expected to revise actuarial targets, while at the same time evaluating the risk appetite in search of greater profitability.
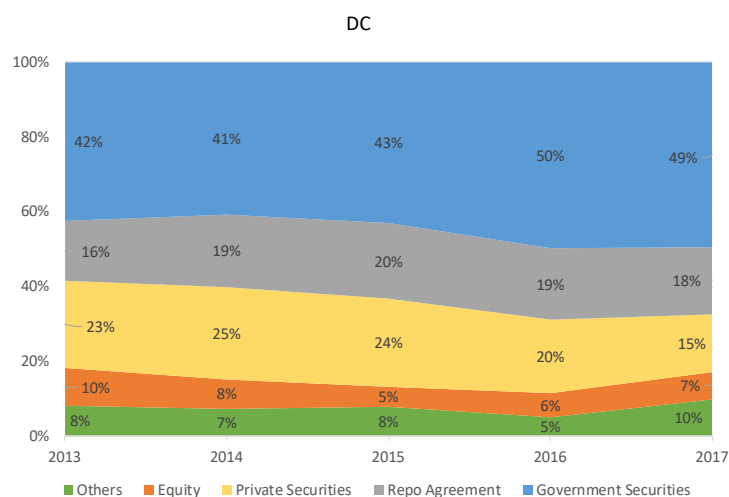
2.3 Solvency

The solvency of the industry showed a significant improvement in the period, given the evolution of the net situation, which decreased from a deficit of R$ 52 billion at the end of 2016 to approximately R$ 16 billion in December 2017.

The positive dynamics of solvency are the result of the gradual improvement of the economic activity and, mainly, of the recovery plans implemented s, in the approximate amount of R$ 39 billion, especially those made by Systemic Important Entities (ESI).

Notwithstanding the improvement, the solvency of the system still depends on the success in the recovery plans implemented in DB plans, which will require, in general, greater contribution from the participants and investment from the sponsors.

Any obstacles to the fulfillment of the equations may cause problems of viability and continuity of

14 Real estate investment funds have been considered in the calculation

Graph 6: Portfolio Composition – DC plans

DC

Graph 7: Portfolio Composition – VC plans

VC
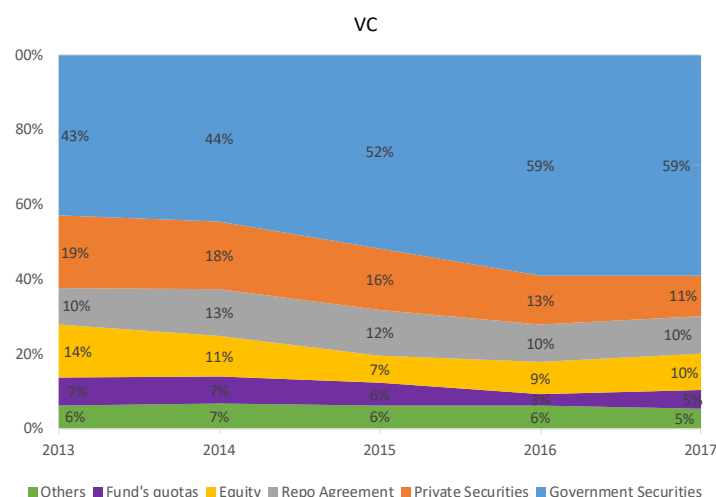
Graph 8: Portfolio Composition – DB plans

DB

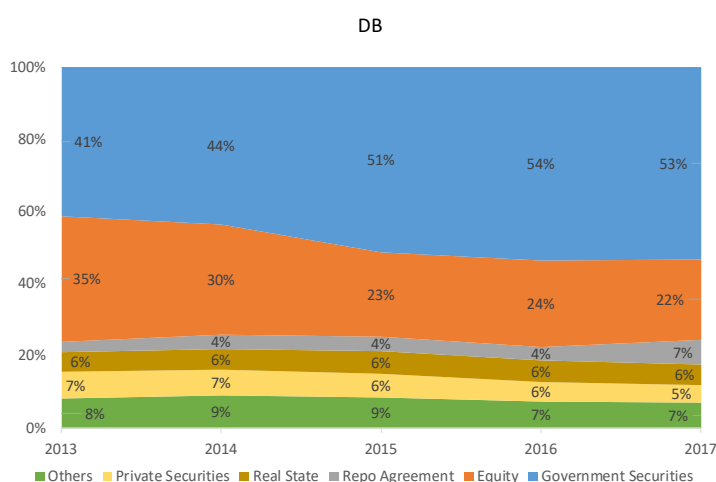plans, with consequent reflection on the solvency of the system. Previc continues following this dynamic, being able to evaluate the adoption of measures to ensure the regular functioning of the industry.

2.3.1 Solvency Index

The solvency index (IS) of the system grew from 0.96 in December 2016 to 1.0 in December 2017. Considering only DB plans, IS increased from 0.93 in December 2016 to 0.99 in December 2017.

The frequency distribution of the plans by quantity shows that, in 2017, only 11 DB plans have IS below 0.7 (Graph 9), being just one ESI.

Greater funding level of the system is highlighted by the increase in the number of plans with IS between 1.05 and 1.5, from 2016 to 2017, as both the IS below 0.7 and above 1.5 evidence high deficits and undistributed surpluses, respectively.

Strongly influenced by the deficits' reduction in the system, an IS average close to 1.0 shows that the resources available in the short and long term are sufficient to meet the remaining actuarial liabilities[15].

The growth of the IS was due to the equations[16] made in some of the main ESI of the system and the return obtained from investments in the second semester of 2017.

Few ESI plans had a decrease in the IS, highlighting negatively two ESI plans with IS below 0.8, which are under supervision.

As shown in Graph 11, ten plans run by non-ESI concentrate critical solvency problems (IS below 0.7), but representing only 1.10% of total assets allocated in DB plans.

2.3.2 Funding level: deficits and surpluses

Confirming the estimation presented in the last report[17], the consolidated result improved by decreasing the negative balance to R$ 15.6 billion

15 Solvency Index below one does not necessarily represent unconformity. The current solvency norm establishes the need for compulsory equations for deficits above certain limit.

16 Conditions to equation: i) the sponsors' economic and financial capacity to make the necessary investments; ii) speed at approving equation plan approval in the responsible instances; and iii) the participants' financial capacity to support the increase in their contributions.

17 REP October 2017

Graph 9: Solvency Index Distribution
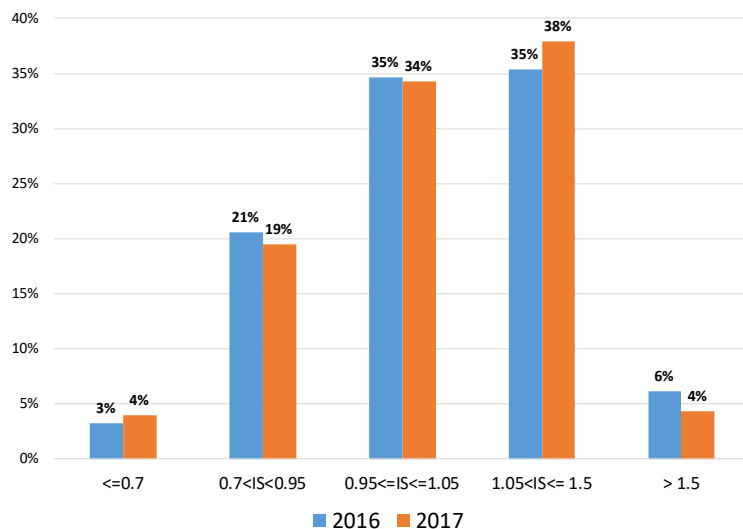
Graph 10 ESI: Solvency Index - DB plans
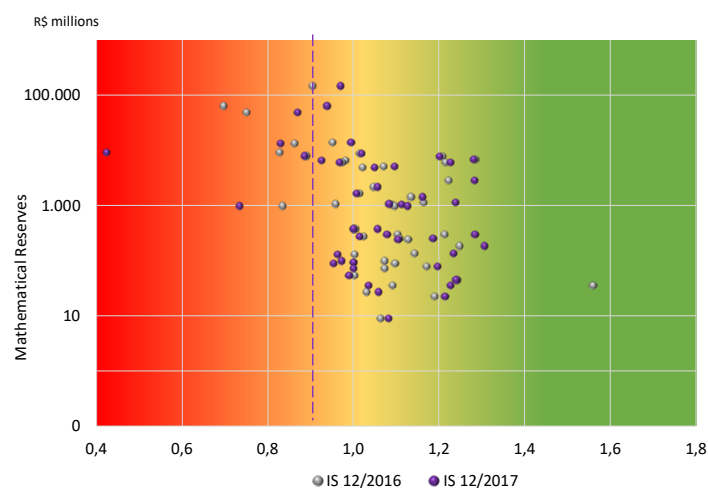
Graph 11 Non-ESI: Solvency Index - DB plans

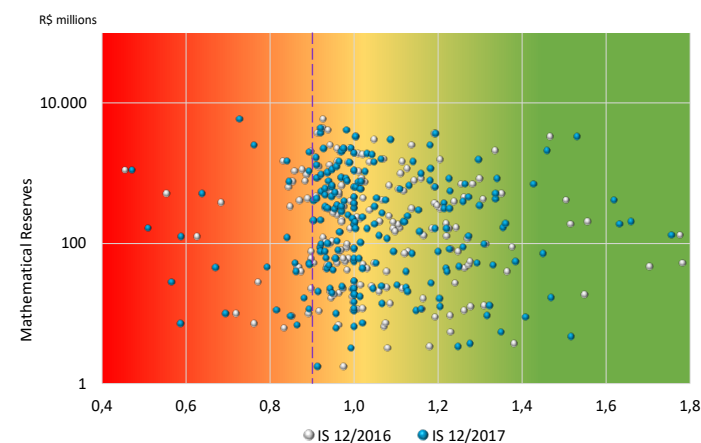in the period, especially due to the sharp reduction of the deficits from R$ 72 billion to R$ 36 billion. Contrary to the trend observed in the last years, the result of the second half of 2017 was quite positive.

Once maintained the recovery plans implemented in 2017, deficit reduction and maintenance of positive results may appear in the next semester.

2.3.3 Sponsor's Dependence

The dependence of the PF on their respective sponsors[18] remained stable in the period, although non-ESI showed a dependence reduction in the period. From the 2015 apex, when it reached R$ 88 billion in the system, the amount committed by sponsors with the PF reduced to R$ 84 billion in December 2017 (Graph 13)[19] .

With regard to ESI, despite the significant amount and the positive result, the sponsor's dependence remained stable[20] (Graph 14).

The deficits with potential recovery plans needed presented an expressive reduction in the ESI group, which reached R$ 7 billion in December 2017. Non-ESIs, in turn, have very small deficits (Graph 15).

Regarding the total assets, the average percentage of the system's commitment to the respective sponsors decreased from about 11% in 2016 to 10% in December 2017, and this movement occurred homogeneously both in the ESI and in the Non-ESI.

On average, in December 2017, the ESI and Non-ESI's dependence on sponsors corresponds to 13.2% and 4.2% of assets, respectively (Graph 16).

This dependence on sponsors constitutes an additional risk to the viability of the benefit plans, especially in view of the less robust economic and financial situation of some sponsors.

In addition, from the investment management point of view, there is a reduction in the amount of funds available for management, since the debts contracted by the sponsors represent funds settled at the rates equals to the actuarial targets. Thus, the

18 Sponsor's dependence is expressed by the sum of the debt (account 1211040000), the late contributions (account 1211020100), the past service – investments to be made (account 2311030101), equation deficits (account 2311030201), special contribution adjustments (account 2311030301) and the accrued deficit (account 2320000000).

19 In June 2017, sponsor's dependence was R$88 billion

20 Should the equations be reverted by legal decisions or not be fulfilled, sponsor's dependence may grow significantly.

Graph 12: Surpluses and Deficits
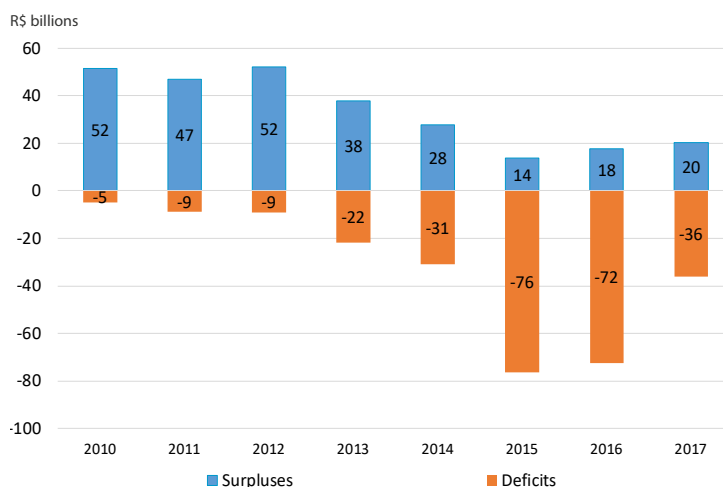
Graph 13: Sponsored Dependency

Graph 14: Sponsored Dependency - ESI

greater the sponsor's dependence, the lower the availability of funds actively managed by PF.

2.4 Liquidity Risk

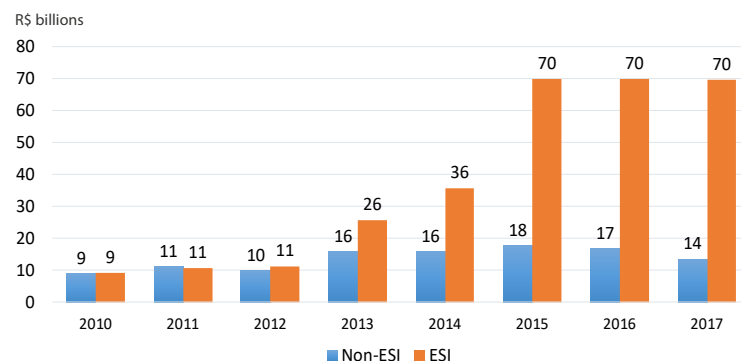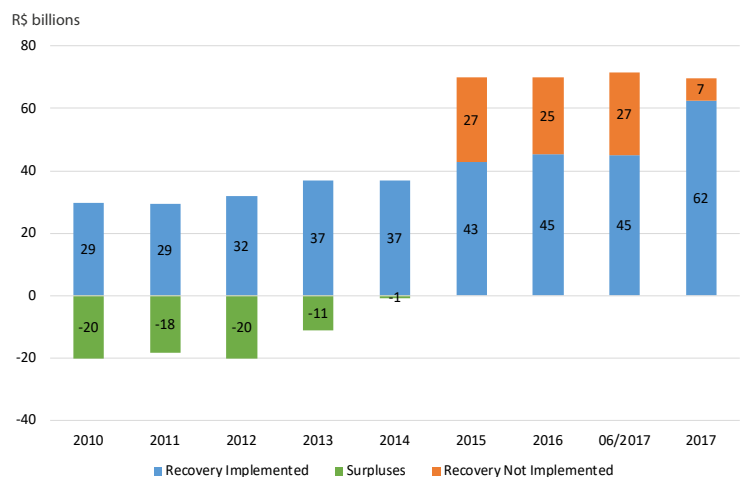The liquidity risk of the system remains low. The system holds assets that are eligible to meet its obligations in the short and medium terms.

PF plans with a Long-Term liquidity index (ILA) below one are under supervision actions to adopt corrective measures.

The liquidity risk analysis of the benefit plans also includes the assessment of potential financial losses arising from the repayment of assets at prices below those practiced in the market to meet their obligations to pay benefits to participants.

For the purposes of measuring and analyzing liquidity risk more thoroughly, there are three indicators: i) Long Term Liquidity Index (ILA); ii) Short Term Liquidity Index (ILR); and (iii) Duration Gap (DD)[21].

2.4.1 Long-Term Liquidity Index

The Long-Term liquidity index (ILA) measures the availability of liquid assets, regardless of their maturity or volatility, to meet obligations with participants projected for five years.

The average consolidated index[22] for DB plans was 2.39 in December 2017, showing a slight improvement compared to June 2017, when it was 2.36. Considering only the DB plans managed by ESI, the index was 2.15 in December 2017 (Graph 17).

Therefore, on average, net assets exceed by more than twice the cash needs to meet the obligations with the participants' benefits payment.

2.4.2 Short-Term Liquidity Index

The Short Term Liquidity Index (ILR) considers only fixed-income rate flows in relation to actuarial liabilities up to five years.

The consolidated ILR for all DB plans was 0.78 in December 2017, while it was 0.70 for the DB

Graph 15: Sponsored Dependency - Non-ESI
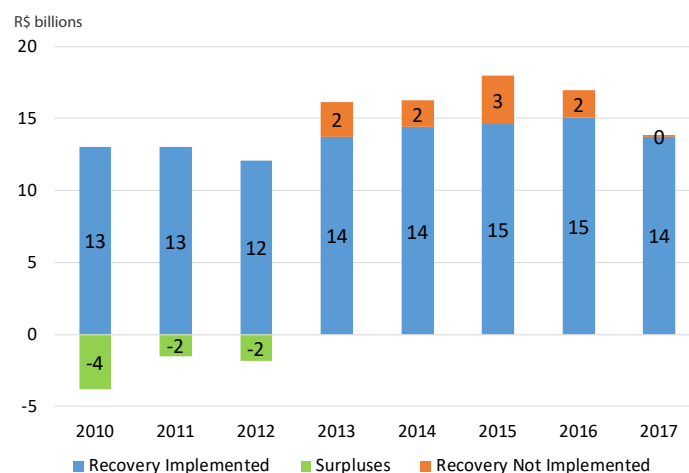
Graph 16: Sponsored Dependency to Total assets

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21 These indicators evidence the plans capability to meet their obligations with the participants in the short and medium terms, considering more and less liquid assets, as well as demonstrate the term mismatches existing among the plan assets and liabilities.

22 Calculated based on the consolidated system values
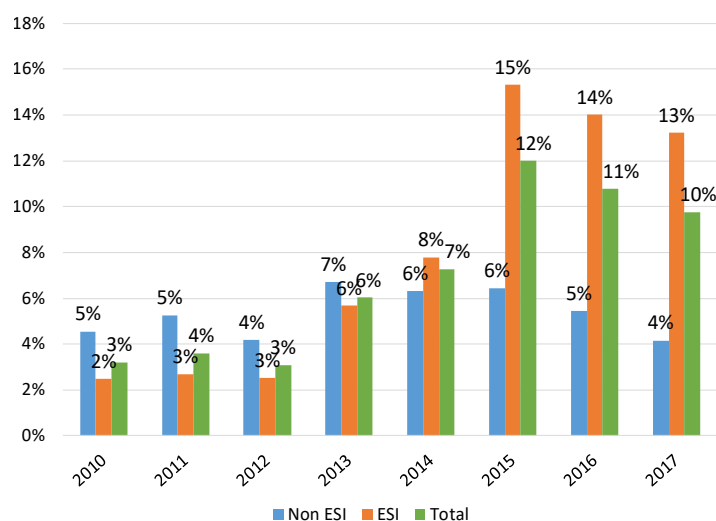
plans managed by ESI. When compared to June 2017, when they were 0.75 and 0.72, respectively, it is possible to observe that only non-ESI group increased its liquidity.

The ILR lower than one found in some benefit plans (Graph 18) suggests the anticipation needs of selling fixed income rate assets or other assets to meet cash requirements for the next five years [23].

The obligation to sell assets, imposed by the urgent actuarial commitments, tends to expose the plan to greater market risk, to the extent that the realizations are carried out under adverse market conditions, at prices lower than those set when target.

On the other hand, based on the premise that the plan is well balanced, the ILR much higher than one may indicate excess of liquidity and consequent risk of reinvestment.

2.4.3 Duration gap

The duration gap between assets and liabilities reflects the difference between the receivables average maturities of fixed income rate assets (including coupon flows and amortization) and the flows of benefit payments deducted from the flows of retired participants' contributions.

The liability duration of all DB plans is 11.46 years, using 5.32% per year[24] at a discount rate. Regarding the DB plans administered by ESI the liability duration was 11.5 years, at a discount rate of 5.43% per year [25]. The average duration reflects that the DB plans are mature.

In such period, there was negative gap, when the liability duration is significantly higher than the duration of fixed income rate investments. With gaps over 6 years, the number reduced from 86 to 68 plans between June and December 2017, which totaled R$38 billion assets. In the ESI group, there are seven plans in this situation, which totalize R$ 22 billion (Table 2).

23 Such obligation to sell assets, imposed by the permanent actuarial commitments, tend to expose the plan to higher market risks, in as much as it needs to be carried out in adverse market conditions, that is, at prices lower than the ones established as targets.

24 Aggregated actuarial rates were calculated based on information from Actuarial Statements, as of December 31st, 2017, by means of actuarial rates in the plan pricing groups weighed by the respective mathematical provisions of DB plans.

25 Same method as the previous footnote, applied to DB plans managed by ESI

Graph 17: Long Term Liquidity Index - DB plans

Dec/2017

R$ millions

Total Investments

ILA ESI   ILA Non-ESI
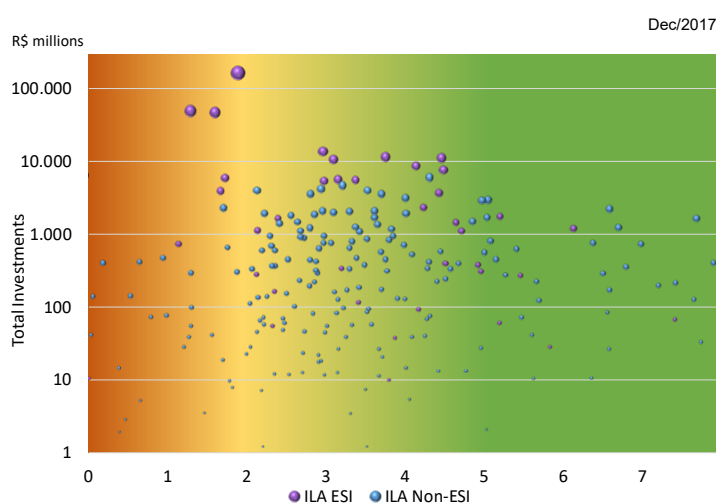
Graph 18: Short Term Liquidity Index -DB plans

Dec/2017

R$ millions

Total Investments

ILR ESI   ILR Non-ESI

Chart 2: Time Gap between assets and liabilities

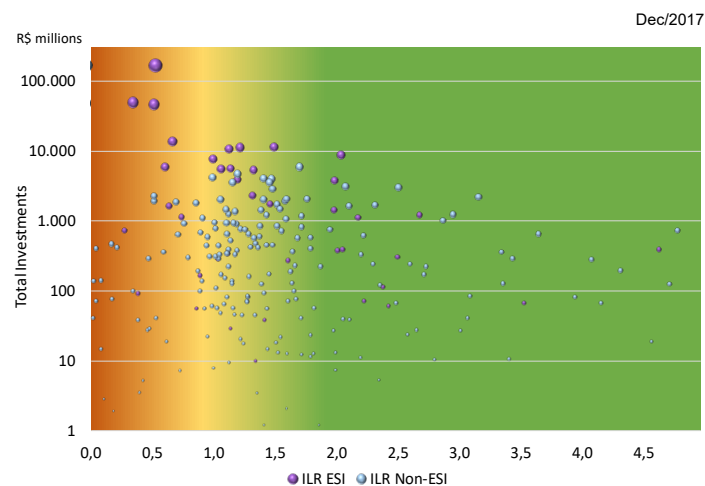| Years Gap	AGGREGATED		ESI	
	Nº Plans	Amount (R$ billion)	Nº Plans	Amount (R$ billion)
<-9	42	11	1	4
>=-9 e <-6	26	27	6	18
>=-6 e <-3	61	46	10	18
>=-3 e <0	95	332	16	281
>=0 e <3	56	63	10	41
>=3 e <6	8	14	4	11
>=6	18	8	2	7

2.5 Credit risk

The analysis of the potential losses of financial assets showed that credit risk is not systemically relevant, despite the slight deterioration in the credit quality.

However, there are still plans with highly expected loss, which suggest poor quality in asset selection, deficiencies in credit risk management or, in isolated cases, evidence of fraud in the investment operations [26], which led to the constitution of provisions.

2.5.1 Credit Risk: Expected losses

The credit risk assessment based on the portfolio expected loss (PE), inferred from the issuers' credit risk assessments made by rating agencies, estimates the probability of private securities default (PD).

For assets with no valuations available, around 10% of the total private securities held by benefit plans, a discretionary method assigns value to PD. The PE of the evaluated securities added to the loss of the securities without available valuation is an aggravated expected loss (PEA).

The data show that the risk of PE in relation to the total of private securities rated (TPA) remains low, despite the loss of quality of credit, which increased the average of PE to more than 1%. With this aggravation, PEA in relation to the total private securities reaches 2.46% in the average for the consolidated and 3.05% for the ESI (Graph 19).

Considering the low participation of private securities to the total investments, the expected

Graph 19: Expected Loss (PE)

Dec/2017

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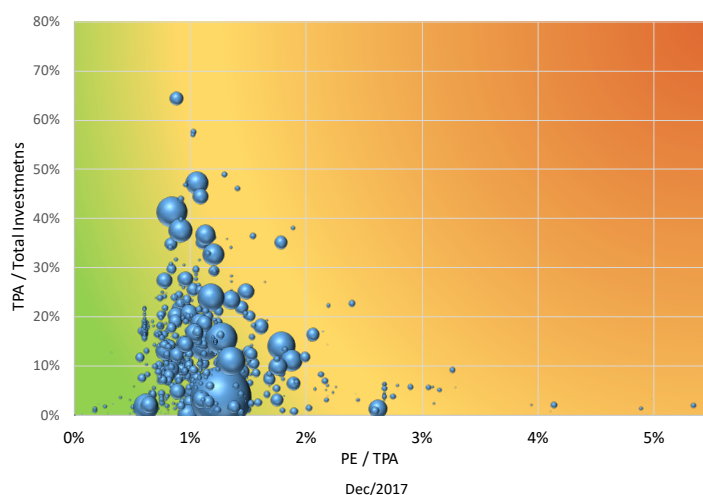
26 The identified cases are under investigation.

losses are close to 0.20% of the total, even when aggravated.

However, there are isolated cases of plans with higher expected loss, which accounted for more than 30% of the private securities portfolio (Graph 20).

2.6 Actuarial risk: interest rates

2.6.1 Parameter rate

The limit references disclosed by Previc as parameter interest rates[27] for actuarial interest rates from 2018 reflected the reduction in the real interest rates. For example, the upper limits of the intervals for a 10-year plan reduced from 6.66% to 6.39% (Graph 21).

In 2017, the average actuarial rate of the DB plans was 5.32% per year. For the ESI and non-ESI groups, DB plans recorded an average actuarial rate of 5.31% and 5.36% per year, respectively.

However, despite the expectation of a reduction in the Selic interest rate, long-term rates have not been decreasing with the same intensity.

Based on the parameter rates disclosed and the information on actuarial interest rate[28], nine plans would be out of the interval authorized for 2018. However, with cap reduction confirmation, the number of noncompliant plans will increase significantly if they do not adopt corrective measures.

Currently, 125 plans have actuarial rates above 5.5%, which may need adjustment in the coming years in order to reflect this reduction in interest, if they remain low.

It is important to point out that the reduction in interest rate of benefit plans must reflect the asset profitability estimated by the technical area and the reality of the actuarial target, based on the valuation.

The plans are expected to adjust actuarial interest rates to the new interest rate in the short and medium terms, and consequently, reflect on actuarial obligations.

Graph 20: Aggravated Expected Loss (PEA)
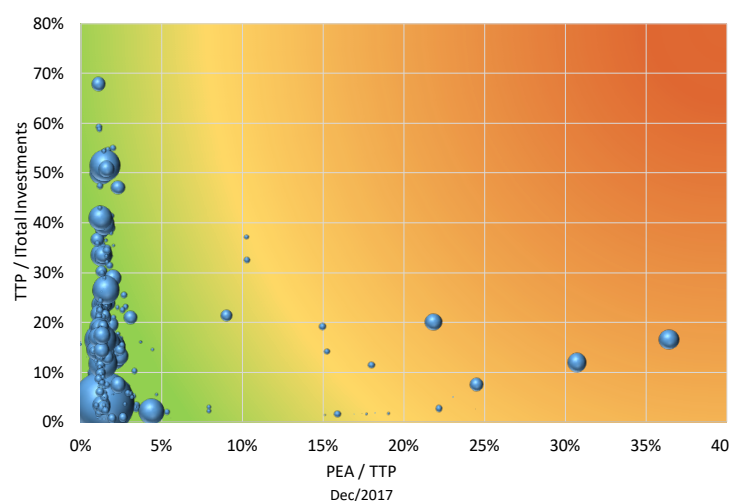
27 Ordinance 363 of April 26, 2018.

28 Actuarial Statements of 12/31/2017.

2.7 Profitability

The managers of PF look for investments that maximize returns at certain risk levels, and provide at least for mutual plans, the fulfillment of established actuarial targets that will guarantee the payment of present and future obligations.

2.7.1 Systems' Profitability

The system's profitability behaved satisfactorily in 2017, when compared to an average reference rate for the correction of liabilities. The average income of the system in 2017 was 11.52%, for an average liability's reference rate of 7.49% (INPC + 5.32% a.a.).

Both the ESI with an average profitability of 11.92%, and the non-ESI, with an average yield of 10.89%, had results above the referred reference rate.

Likewise, considering the return per plan modality, DB plans obtained 11.68%, VC plans, 10.94%, and the DC plans, 11.90%.

However, profitability above the INPC + 5.32% in 2017 was not enough to cover the negative results observed since 2013, which generated significant deficits (Graph 22).

Regarding the contribution to ESI results, the class of assets that generated the highest profit in the period was the class of assets' variable income, with an average profitability of 18%, represented both by shares directly allocated to the investment portfolios of the benefit plans and the investments in equity funds. Assets' fixed income provided the second largest profit, with a profitability of 10%, composed mainly of federal government bonds (Chart 23).

Similarly, for non-ESI, the assets' variable income class generated the highest returns in the period, with an average profitability of 25%. Assets' fixed income also appeared as the asset class with the second highest profit, at 10%.

Graph 21: Actuarial Risk: Interest Rate

Graph showing Interest Rate Per Year % (y-axis, 3.0 to 7.5) versus Duration Years (x-axis, 2 to 34). End labels: 6,63; 6,36; 5,92. Legend: Limits 2017, Limits 2018, Proj. limits 2019, Actuarial Rate 2017 (%).
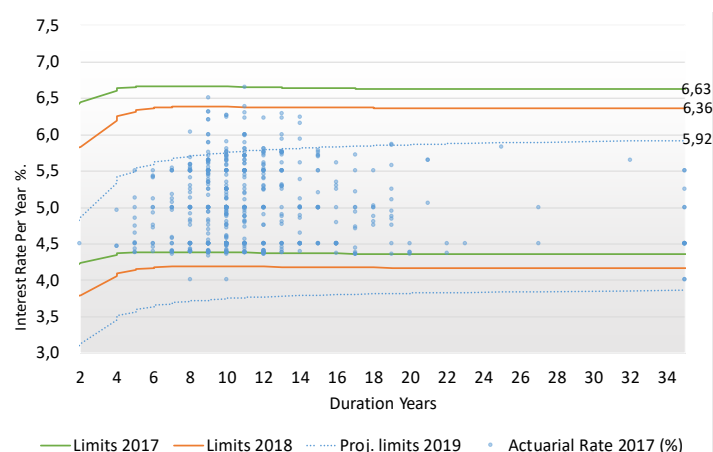
2.7.2 Plans' Profitability Analysis

The plans' profitability analysis allows identification of differences in performances. Regardless of their type, managers of benefit plans seek to make investments that maximize profits at certain levels of risk.

In DB plans, the established actuarial target serves as the minimum reference rate goal of the investments. For DC plans, there is no "ex ante" reference rate, as in the DB plans.

Nevertheless, for both DB and DC plans, there are returns considered "free" from idiosyncratic risks that can serve as a parameter to measure the performance of financial management, as well as to assist participants in the management and supervision of these resources.

Therefore, we sought to identify average market benchmarks for the seven-year and one-year periods (2017), in order to compare the average profitability of the different types of plans in the same periods (Table 3).

Graph 22: Profitability vs Average Actuarial Rate
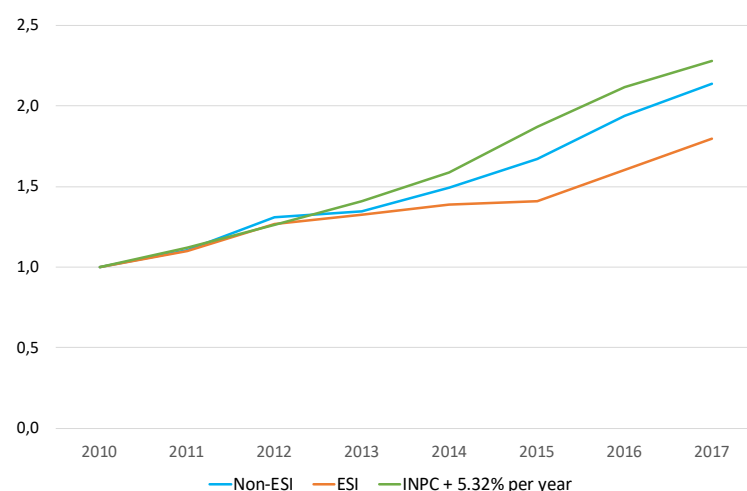
Graph 23: Profitability by Assets - ESI
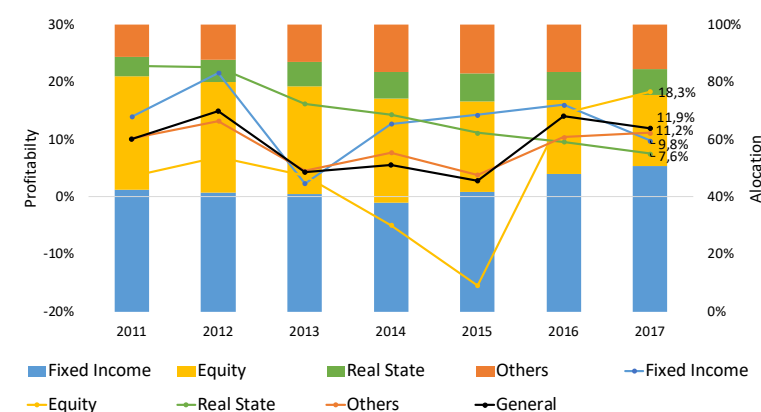
Graph 24: Profitability by Assets – Non-ESI
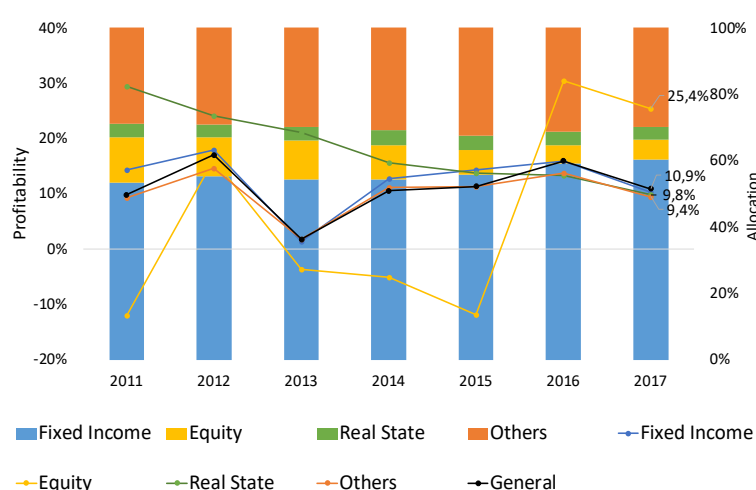
Chart 3: Benchmarks

	Selic	IMA-B	Ibovespa	IPCA
Annual Average Profitability: 31/12/2010 to 31/12/2017.	10,9%	12,7%	1,4%	6,26%
Profitability 2017	10,0%	12,8%	26,9%	2,9%

2.7.2.1 DB Plans' Profitability Analysis

The distribution of DB plans by profitability over a seven-year period shows a better performance of the plans managed by the non-ESI, which concentrated 179 plans (68%) in the average profitability range of more than 10% per year. (Graph 25).

Regarding DB plans managed by ESI in the same seven-year period, 29 plans (55%) had an average profit of more than 10% per year. However, the volume of funds managed by these plans corresponds to only 28% of total investments.

In the range with an average profitability more than 10% per year, there are 29 plans managed by ESI (78%) and 148 by non-ESI (58%), highlighting that the total volume of managed resources reaches more than R$ 358 billion, equivalent to 72% of the total (Graph 26).

According to the distribution analysis of DB plans by profitability intervals in 2017, there was a general improvement in average profitability, compared to the average of seven years, both in the plans administered by ESI and by non-ESI.

Based on the comparison of the average profitability of DB plans with the average market benchmarks over the seven-year period, most plans were either more profitable than Ibovespa and IPCA or reached the same range of average Selic profitability. The only benchmark not achieved by most DB plans was the IMA-B.

In comparison with the market benchmarks of 2017, the profitability of most plans was equal to or higher than the IPCA and the Selic. As for IMA-B and Ibovespa, a smaller number of plans with a high participation in the total investments of the system surpassed or approached these benchmarks.

2.7.2.2 VC and DC Plan Profitability Analysis

With regard to VC and DC plans, 369 (53%) plans managed by non-ESI, with investments corresponding to 63% of the total, had average profitability above 10% per year, in the seven-year period.

In the VC and DC plans managed by ESI, 41 plans (58%), with 37% of the total investments, had average profit above 10% per year in the seven-year period. (Graph 27).

The analysis of VC and DC plan distribution with average profitability rates in 2017, compared to the seven-year period, shows greater profitability both in the plans managed by ESI and in the plans managed by non-ESI (Graph 28).

The number of VC and DC plans in the average profitability range of more than 10% per year is significant, 58 of which are managed by ESI (82%) and 584 are managed by non-ESI (86%). The total funds managed by them reaches more than R$ 238 billion, equivalent to 83% of total investments.

Therefore, last year's performance of investments (2017) contributed significantly to the improvement in the accumulated performance of the pension fund system in the last seven years.

2.8 Investments: a prospective view[29]

The observations about the macroeconomic scenario and the investment estimations for 2018 were based on information obtained from a group of ESI that represent more than 50% of the total assets of the system.

Internationally speaking, there is a favorable scenario, with high international liquidity, GDP growth in the Euro Zone, the US and China, and an appetite for investing and taking risks in emerging markets (EME).

These risks lie in the eventual consequences of imminent changes in the foreign scenario, with an increase in the US interest rate, a resurgence of the trade dispute and geopolitical issues.

In the domestic scenario, the economy shows signs of gradual recovery, with a forecast GDP growth of

Graph 25: Average Profitability 7 years – DB plans
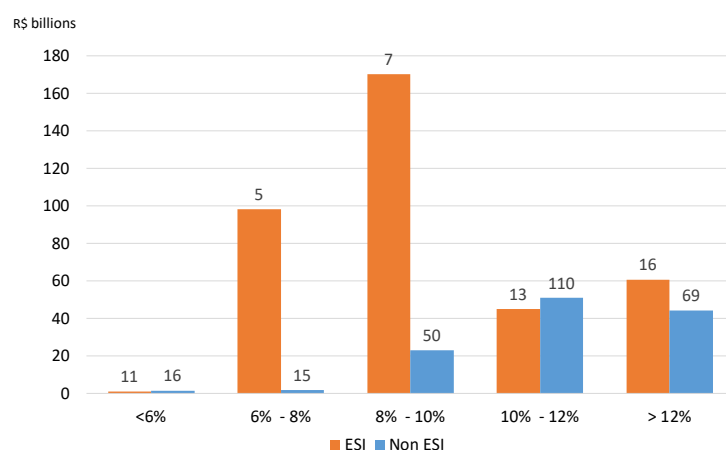
Graph 26: Average Profitability 2017 – DB plans

29 The analysis is a result of interviews with ESI managers made between March 26 and 29, 2018.
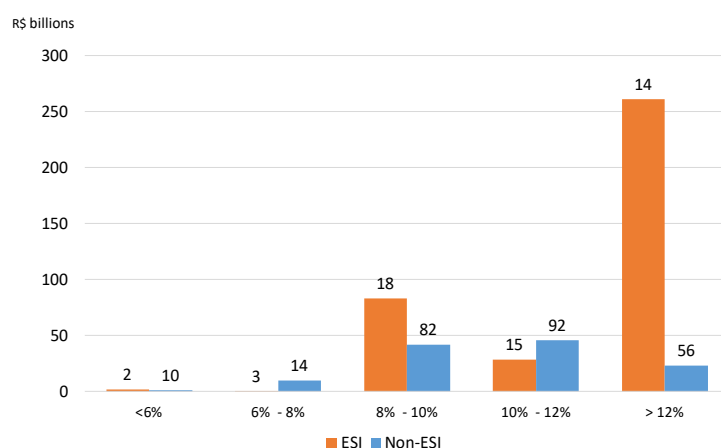
2.6% for 2018, controlled inflation and historically low interest rates.

However, there are doubts about the robustness of a sustainable growth in the medium and long terms. Election results, rising of public debt, unrealized structural reforms, lack of investment and long-term funding may hinder growth in the desired intensity.

In terms of the resources allocation, the conservative investment policy, the maturity of DB plans, and the consequent need for liquidity for benefits' payments in significant volumes[30], combined with the scenario of uncertainty in the short term, it will require investments in financial assets with high liquidity in 2018. In this sense, despite the volatility expected in the short term, there are no signs of stress for the benefits' payments.

In the medium and long terms, with the maintenance of low interest rates and the inflation control, the challenges to reach the actuarial target increase. Nevertheless, the portfolio composition should not change abruptly with the expectation that investments in fixed income securities will remain at high levels, mostly in federal government securities, followed by private securities.

As for equity's income, the interviewed managers observed a strong increase in the last two years and there is a perspective that it will remain positive in the short and medium terms, with growth in 2018 and 2019. Changes in the composition and volume of investments in equity expected according to the characteristics of each portfolio and the investment policy of each PF.

As far as investment funds are concerned, no new allocation in FIP will happen in 2018. Regarding FIDC, despite the low appetite, the investment decision depends on the quality of the fund's credit portfolio.

In general, multi-market investment funds tend to be more preferable by the flexibility and possibility of portfolio customization.

Investments abroad are options for diversifying risk and structuring defensive strategies, given the expectation of greater domestic volatility. Nevertheless, the high prices of assets abroad is still a barrier.

30 In 2017, approximate payment flow of R$26 billion from seven ESIs among the top ten.

Graph 27: Average Profitability 7 years – VC and DC plans

R$ billions
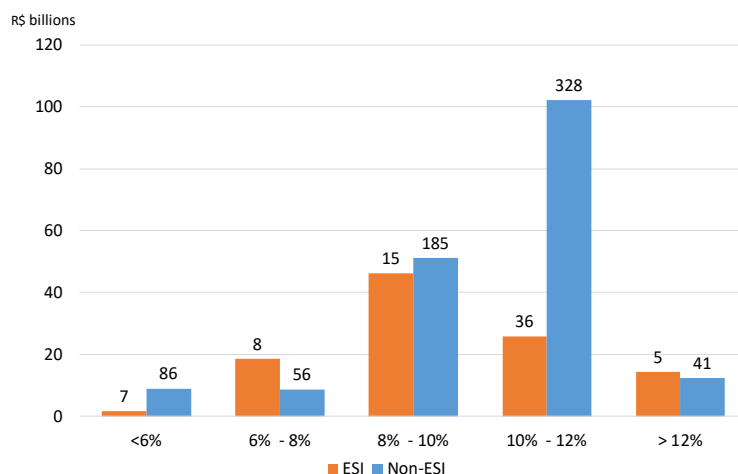
Graph 28: Average Profitability 2017 – VC and DC plans

R$ billions
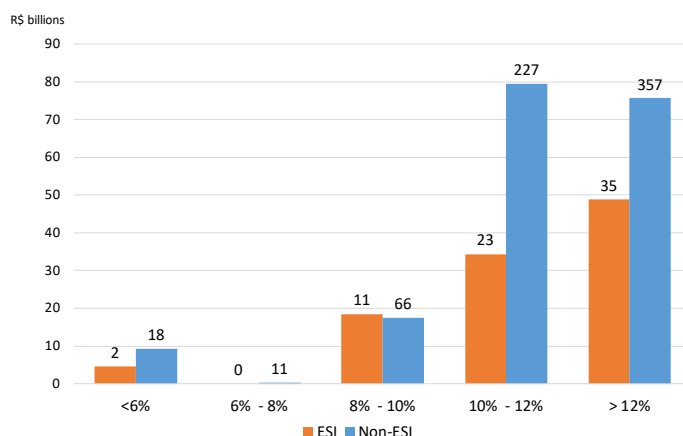
There are prospects of divestments in real estate and there are also the structuring of real estate investment funds to provide greater liquidity.

Regarding emerging actuarial risks, there is consensus on the need to reduce actuarial targets, in order to adapt them to the new macroeconomic context. The expectation is that the impact on the actuarial liability match the investments' returns.

Finally, the practice of conditioning investments returns to actuarial liabilities is fundamental for good management, especially at a time of historically low interest rates.

2.9 Final remarks

Expectations and long-term solvency are determinant factors for the sustainability of pension fund systems. Therefore, Previc has sought to address issues of supervision and to improve the rules of the sector looking for a more sound and safety system.

Although there are no liquidity or solvency problems in the short term, even in a scenario of higher volatility, medium and long-term projections require greater attention from managers, both in investment decisions and in the definition of actuarial premises.

Thus, the maintenance of low interest rates implies a more challenging scenario to obtain profitability compatible with actuarial obligations, considering the decrease in the profit on fixed income assets, especially federal public securities, and the increase in actuarial liabilities.

In this way, there is expectative that PF implement the necessary adjustments to reconcile the return of assets to liabilities, either by seeking greater profitability in investments, by adjusting cost plans and/or reviewing actuarial premises.

Another relevant point to strengthen the system is the diligent treatment of PF recovery plans in process. The values magnitude of the recovery plans and the speed of implementation are determinant for the success of the process and increase of the confidence. Difficulties for having the recovery plans fully implemented may imply problems of viability and continuity of the plans, whichwill deserve more close supervision.

Finally, within the scope of specific regulatory measures, Previc remains committed to improving the regulatory framework in order to strengthen the defense lines of the pension funds system through the implementation of rules that foster governance improvement. It, includes the establishment of others criteria for management action, modernization and simplification of investment rules, with a focus on improving the internal and external audit process, more effective participation of self-regulation, adoption of preventive prudential measures and increase the effectiveness of the punitive process, with the implementation of more suitable instruments.

box **1** Regulating Alterations

1.1 Investment Rules

The National Monetary Council (CMN), through the issuance of Resolution CMN nº 4,661, of May 25, 2018 (Res. CMN nº 4,661/2018), updated the rules on investments made by pension funds (PF). The purpose is to lead the entities to the improvement of their internal management, in order to mitigate the risks inherent to the management of the assets and to provide security to participants, both assisted and sponsors.

The new resolution seeks to strengthen the lines of defense of entities, with a focus on improving the decision-making process, reducing the risks of potential conflicts of interest and strengthening internal controls. The higher requirements regarding transparency, governance and risk management were to ensure the integrity of foundations. The fiduciary duty of those involved in the investment advisory and decision process has become clearer.

The obligations related to the selection of managers and other service providers and the analysis of investment risks were to improve and reinforce environmental, social and governance principles in risk analysis.

The norm indicates that PF will need to focus on the matching of asset and liability flows for risk mitigation purposes, especially the liquidity risk required to pay benefits. There will be specific requirements for application in higher risk and complexity assets and a reinforcement to the practice of risks and assets segregation.

The standard also incorporates advances in financial products and standardizes the investment regulatory framework. At this point, we highlight the improvements in the registration and custody of assets, the harmonization of financial products with the Brazilian Securities and Exchange Commission (CVM) and the investment in the Stock Market - Access Market, among others.

The limits of fixed income instruments issued by publicly owned companies were standardized. Regarding structured investments, the Structured Transactions Certificate (COE), even without protected capital, is subject to a limit of 10%. The limit for the real estate industry went from 8% to 20% of the equity of each PF benefit plan.

The investment limit on Investment Funds (FIP), in turn, reduced from 20% to 15% of the assets of each benefit plan. Only FIP classified as "Investment Entities" by CVM will be an investment option and the manager will be required to have at least 3% participation in the subscribed capital of the fund (skin in the game"), in order to guarantee the alignment of interests. Also noteworthy is the prohibition of direct or indirect acquisition of FIP quotes abroad.

As for the real estate industry, the new regulation restricts new direct investments in real estate, in accordance with Resolutions CMN nº 4,444, of November 13, 2015, CMN nº 3,922, of November 25, 2010 and CMN nº 2,283, of June 5, 1996. The reasons for such adjustments involve issues related to pricing, improvement of liquidity potential, efficiency gains with the specialized management of Real Estate Investment Fund (FII) and harmonious treatment with other types of investment.

In accordance with the average duration of the liabilities of the defined benefit plans (DB), which most apply in the real estate industry, there was the implementation of a twelve-year term for the divestment of real state premises. An alternative to PF keep the real estate in the portfolio will be by real estate investment funds, which can receive PF's real estate assets.

Regarding foreign investments, the objective is to encourage the diversification of investments in line with risk mitigation, making limits and requirements more flexible, since that prudential management rules observed in such transactions. In this sense, Resolution CMN nº 4,661/2018 incorporated the rules established by Resolution CMN nº 4,626, of January 25, 2018.

The changes sought to relax the concentration limit from 25% (twenty five percent) to up to 100% (one hundred percent) in the case of foreign investments made by PF through national investment funds that observe following conditions:

• Incorporation in Brazil as an open condominium, with the suffix "Investment Abroad" and compliance with the regulations established by the CVM for funds destined to qualified investors.

• Investments abroad only through quotas of funds established abroad (FI-EXT), with a minimum investment of 67% (sixty-seven percent) in FI-EXT and use of the rest of the portfolio for local assets and derivatives. These are only for hedge purposes (hedged to local fund short-term operations and leveraged higher than the fund's equity).

• Concentration limit of 15% (fifteen percent) of the equity of an FI-EXT.

In addition, in order to enhance the quality and security of investments abroad, all FI-EXT belonging to national funds that have PF as shareholder, regardless of their participation, must follow the following cumulative requirements:

• Tracking record of performance minimum of 12 (twelve) months.

• A manager who has been in business for more than five (5) years and who manages more than US$ 5 billion of assets at the time of the investment.

The provisions of Resolution CMN nº 4,661/2018 point to regulatory simplification and alignment with other market norms. Previc will be responsible for regulating operational issues.

1.2 Transfer of benefit plan management between PF

The Resolution CNPC nº 25, of September 13, 2017, establishes rules for the management transfer of benefit plans between PF.

In setting rules and standardizing procedures, the standard sought to ensure transparency and legal certainty to the operation, making it clear, for example, that the prerogative of the transfer of management is the sponsor, with the 180-day deadline for the entity to file the transfer request to Previc for analysis.

An important point in the new regulations is the preservation of the continuity of the social security relationship, guaranteeing the transfer of all the participants and the beneficiaries and of all the assets and liabilities, including the rights and obligations provided for in the regulation of the benefits plan.

The novelty brought to the system was the creation of the Transfer Plan, signed between the sponsor and the entities of origin and destination. Guidelines of the Transfer Term, schedule, form of document availability, will be established, likewise other important definitions for the proper process progress.

1.3 Independent Audit and Audit Committee

In order to strengthen the supervision of the PF, the Resolution CNPC nº 27, of December 6, 2017, regulates the independent audit in the PF. The Resolution aims at aligning rules for the provision of independent auditing services to the best practices of the sector, in line with other industries of the National Financial System (SFN), to provide greater reliability of accounting information, and to the gradually implementation of proportionality regulatory framework.

The norm brought innovations, including the requirement to hire external auditors registered at the CVM, the internal control report prepared by the external auditors, which will address internal controls and governance for ESI, and the creation of the Audit Committee. Previc is elaborating the regulation of this Resolution.

These measures will allow greater transparency and control in the management of PF, since the analyses made by the external auditor will subsidize both the deliberative committee, the fiscal committee, and the decision making of the entity. The intention is to add more governance to the PF's decision process.

1.4 Administrative Fund for the Administrative Management Plan (PGA)

The Resolution CNPC nº 28, of December 6, 2017, establishes rules for the constitution and destination of the Administrative Fund of the Administrative Management Plan (PGA). As from this change, entities may allocate a portion of the administrative fund to be set up to cover development expenses, such as prospecting, studies, implementation of plans and participation of participants.

The Previc Instruction nº 01/2018, of May 3, 2018, which defined the accounting items used for the registration of the Administrative Fund that will be constituted with the purpose of guarantying the costs arising from the development actions.

1.5 Simplification and modernization of the accounting regulatory framework

In order to simplify and modernize the regulatory framework of the pension fund system, the Resolution CNPC nº 29, of April 13, 2018, consolidates Resolutions CNPC nº 08/2011, CGPC nº 04/2002 and CGPC nº 15/2005, in addition to revoking the Resolution CGPC nº 21/2006.

The Resolution CNPC nº 29/2018 delegated the authority to Previc to define specific accounting procedures for the PF, including the accounting plan standards and rules for sending the financial statements to Previc.

1.6 Selection of Managers

Previc and CVM, in accordance with the Technical Cooperation Agreement, signed on March 13, 2018, placed in the agenda the possibility of elaborating regulations to establish procedures and minimum criteria in the selection process and monitoring of resource managers, when third parties are hired to manage PF's resources.

The aim is to raise the quality of management within the closed private pension industry, by requiring greater structure, experience and qualification in the selection process, always observing the size and characteristics of the foundation.

box 2   **Profitability Analysis Per Plan**

The valuation of profitability on investments of the PF uses a standardized calculation method based on information in the financial statements to estimate the actual profitability.

Calculation method:

$$\text{Average profitability} = \left\{ \prod_{t=1}^{n} \left[1 + \frac{RP_t - RN_t}{\frac{(A_t - P_t) + (A_{t-1} - P_{t-1}) - (RP_t - RN_t)}{2}} \right] \right\}^{\left(\frac{12}{n}\right)} - 1$$

Where:

   RP_t positive returns in the tth month, account plan heading 5100000000.

   RN_t negative returns in the tth month, account plan heading 5200000000.

   A_t final balance of the investments in the tth month, item in the accounting plan 1230000000.

   P_t final balance of the operational liabilities of the investments in the tth month, item in the accounting plan 2130000000.

   n is the number of months in the analyzed period.

Interpretation:

The estimation method will be more precise when smaller the range of the data used, the inaccuracies may arise due to the monthly frequency of the data. In addition, because of the use of accounting information, the calculated returns should not be interpreted as "returns based on market value", since the assets may be evaluated with different methods such as economic value or, in the case of fixed income, by the value of "curve" of the securities classified to maturity.

List of acronyms and abbreviations

BCB   Brazilian Central Bank
DB   Defined Benefit Plan
BNDES   *Banco Nacional de Desenvolvimento Econômico Social*
DC   Defined Contribution Plan
CGPC   Pension Funds Management Council
CMN   National Monetary Council
CNPC   National Pension Funds Council
COES   Supervision Strategic Committee
VC   Variable Contribution Plan
CVM   Securities Exchange Commission
DA   Actuarial Statement
DD   Term Mismatch
DI   Investment Statement
DPAP   Liability Duration and Price Adjustment
ECB   European Central Bank
ESI   Systemically Important Pension Fund
FA   Aggravation Factor
Fed   Federal Reserve – US Central Bank
FIDC   Investment Fund in Loans
FIM   Multimarket Investment Fund
FIP   Investment Fund in Finance Projects
IBGE   Instituto Brasileiro de Geografia e Estatística
ILA   Long Term Liquidity Index
ILR   Short Term Liquidity Index
INPC   National Index of Prices for Consumers
IPCA   Wholesale Price Index for Consumers
IS   Solvency Index
LFT   Treasury National Letter
NTN-B   National Treasury Note - series B
NTN-C   National Treasury Note- series C
NTN-F   National Treasury Note- series F
PD   Probability of Default in Private Securities
PE   Expected Loss
PEA   Aggravated Expected Loss
PF   Pension Funds Entities
PIB   Gross Domestic Product
PNAD   National Research for Domicile Sample
PREVIC   Brazilian Pension Funds Authority
REP   Brazilian Pension Funds Stability Report
RF   Fixed Income Rate Bonds and Securities
SBR   Risk-Based Supervision
SELIC   Brazilian benchmark interest rate
Sest   State Company Governance and Coordination Department
SPCF   Private Complementary Pension System
Susep   Private Insurance Superintendence
TA   Actuarial Index
TOI   Total Investments
TPA   Assessed Private Security