

# How do Public Pension Funds invest?

From Local to Global Assets

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## KEY POINTS

- Public Pension Funds (PPFs) have undertaken a major reallocation of assets over the past decade
- Allocation trends have been almost universal despite a huge diversity of geography and economic development
- A key trend has been the move away from holding domestic (local currency) bonds; those assets have been redeployed towards equities and alternatives, with a small share also diverted into foreign bonds.
- We expect most funds to continue taking on more risk and further internationalize their portfolios.

Public Pension Funds (PPFs) held around \$5.9 trillion in total assets as of 2016 and over 4% of all publicly traded assets, according to our estimates, making them a significant global investor group. While it is impossible to capture the entire global investment universe, our research shows that as of 2016, PPFs owned over 7% of global tradeable fixed income assets (including over 8% of government bonds and over 13% of inflation-linked bonds) and over 3% of listed public equity<sup>1</sup>. Although studies indicate that the total size of private pension assets in the world exceeds \$30 trillion<sup>2</sup>, dwarfing PPFs by some margin even with areas of overlap, the assets of these public funds (in 2016) are comparable to the total size of another important investor group, sovereign wealth funds.

Unlike sovereign wealth funds, however, PPFs are rarely analyzed as a group because their diverse nature makes them hard to define. In this paper, however, we have identified certain traits that we believe distinguish PPFs from other types of investors, enabling us to analyze their behavior and the evolution of their asset allocation over the past decade (see What is a Public Pension Fund? section for more information).

**“Despite their idiosyncrasies, PPFs follow a largely universal, one-directional trend, with increased diversification of asset classes and geography.”**

**UNIVERSE**

The universe of investors that fall within our definition of a PPF is numerous and varied. We count 115 institutions in 70 jurisdictions, diverse in geography and economic development. To get a clearer picture of PPF asset allocation trends, we examine the top 16 funds whose assets constitute just over two-thirds of the total universe (see Appendix 2 for methodology).

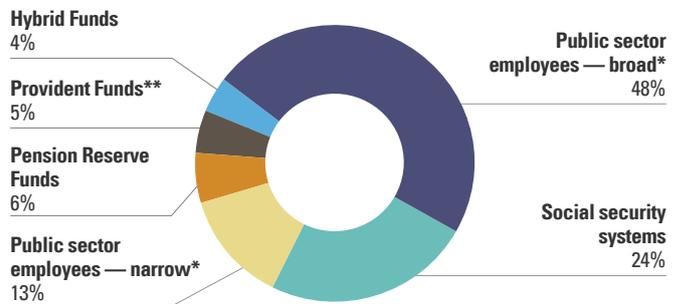
If we look at the full set of funds geographically, we see that a few relatively large economies with big savings pools hold the majority of assets. Roughly half of the assets in our sample originate from Asia-Pacific countries (see Figure 1), of which half is Japan; a fifth originate from North America, which is overwhelmingly Canada<sup>3</sup> as most of the US-based funds, though large in size, do not meet our definition of a PPF. In fact, Canada and Japan together account for almost half of all the assets in our group. European countries, even those with comparable levels of development, have vastly different pension systems, with PPFs playing large roles in only some of them; thus, over 70% of European PPF assets are constituted by three economies: the Netherlands, Sweden and Denmark.

**Figure 1: Share of total PPF assets by region**



Source: SSGA research, based on OMFIF Global Public Investor Report, 2016.

**Figure 2: Share of total PPF assets by mandate**



Source: SSGA research, based on OMFIF Global Public Investor Report, 2016.

\*Narrow funds refer to specialized PPFs for teachers, army, police or municipal workers; broad funds refer to PPFs covering the entire public sector or all civil servants.

\*\*Provident Funds are a type of PPF common in South Eastern Asia, where the government creates a fund for all the employees in the formal private sector. Such PPFs often provide other types of benefits beyond pensions and can be run on a DB, DC or hybrid basis.

If we categorize funds by their mandates (Figure 2), we see that the assets of PPFs serving public sector employees (whether broad or narrow) exceed those of the funds for private sector employees and the general population. This reflects a number of different trends. First, many universal social security systems operate on a pay-as-you-go basis and thus have no assets. Second, several jurisdictions rely heavily on employer-sponsored plans to cover the majority of private sector employees; and their comparable private pension funds do not fall into our study. But in some jurisdictions at least, this higher level of assets for PPFs reflects considerable pension advantages enjoyed by the public sector over the private.<sup>4</sup>

## WHAT IS A PUBLIC PENSION FUND?

### Definition

Unlike many types of public sector institutions, PPFs co-exist with their private sector equivalents and may be easy to overlook within the broader pension industry. Their definition is somewhat elusive and they may be structured differently. Nonetheless, PPFs possess a number of characteristics which distinguish them from other asset owners and are critical to their investment philosophy.

We define PPFs as publicly owned or publicly sponsored pension funds with broad policy missions, integrated into sovereign or large sub-sovereign balance sheets. Instead of simply taking all pension funds with some form of public affiliation, we apply the following tests to a fund's structure and mandate (see Appendix 1 for more detail):

- **Coverage** — a PPF usually covers a substantial share of the population, for example, all public sector employees or, indeed, the entire working population.
- **Policy mission** — a PPF usually has a broad policy mandate beyond the provision of income to its beneficiaries. This mandate can be social security (in which case its strength is proportional to coverage), but certain professional PPFs like army, police and teacher funds may also be critical to broader policy in those areas such as retention of labor.
- **Segregation of assets** — a PPF is usually not completely segregated from the government balance sheet. We would exclude state-sponsored DC systems based on individual accounts, especially if they compete with private sector entities, as their assets have stronger ties to beneficiaries than to governments. Pooled or notional DC schemes would, however, often fall into our definition of a PPF. There are also many public Defined Benefit (DB) funds (notably in the US) whose assets are completely segregated, akin to corporate plans. Their assets normally cannot be redirected for other uses even if their sponsor becomes insolvent.
- **Liability adjustment** — as PPF liabilities are rooted in government promises to a group of citizens, the government has the ability to unilaterally reduce them through legislation; such an option is usually not available for a corporate plan sponsor.

### Differences in Structure and Approach

These characteristics can affect the investment philosophy of PPFs depending on how they manifest for individual funds. At one level, the finances of PPFs are (with the exception of pension reserve funds) similar to those of any pension fund. They receive contributions (or taxes) from current workers and income and capital gains from their investments, and pay various benefits to the retirees. They can assess their current and future liabilities with demographic and actuarial data and manage their assets accordingly.

At a more detailed level, however, the particular nature of PPF inflows and outflows may help or hinder their investment processes.

First, large PPFs usually benefit from mandatory participation, and their sponsor is an unequivocal going concern. Hence, the base for the PPF's contributions is much more stable. This may be offset by the fact that the *contribution rate* may be set politically at a suboptimal level.

Second, PPFs' *benefit liabilities* are often defined legislatively rather than contractually. That means that their solvency can be maintained by a unilateral downward adjustment of liabilities through legislation, though a politically-induced unsustainable increase in benefits can equally be a risk in the other direction.

Third, for PPFs, the government is simultaneously the *sponsor* and the *regulator*. They are usually subject to a special governance framework rather than general pension regulations. The effect of this is twofold. On the one hand, the government may mandate a PPF to invest in asset classes where the private sector capabilities are not yet sufficient; on the other hand, it may compel them to make investment decisions for reasons unrelated to risk and return considerations. For example, they may be forced to invest in government debt, debt or equity of distressed companies undergoing bailouts or, worst of all, to undertake politically motivated direct investments.

Additionally, it is worth highlighting that private pension funds are usually required to assess their actuarial sustainability, and their sponsors must respond to actuarial deficits. In contrast, many PPFs may ignore such variables in the short term, as they benefit from an explicit or implicit government guarantee and can theoretically run their assets down to zero. This may prevent them from making forced investment decisions with suboptimal timing, but also weaken their financial discipline and create complacency on the government's side.

## PPF ASSET ALLOCATION TRENDS

To understand how PPF asset allocation has evolved, we looked at data from 2008 to 2016 and observed a number of patterns which are outlined below. Subsequent sections provide a closer examination of specific asset classes.

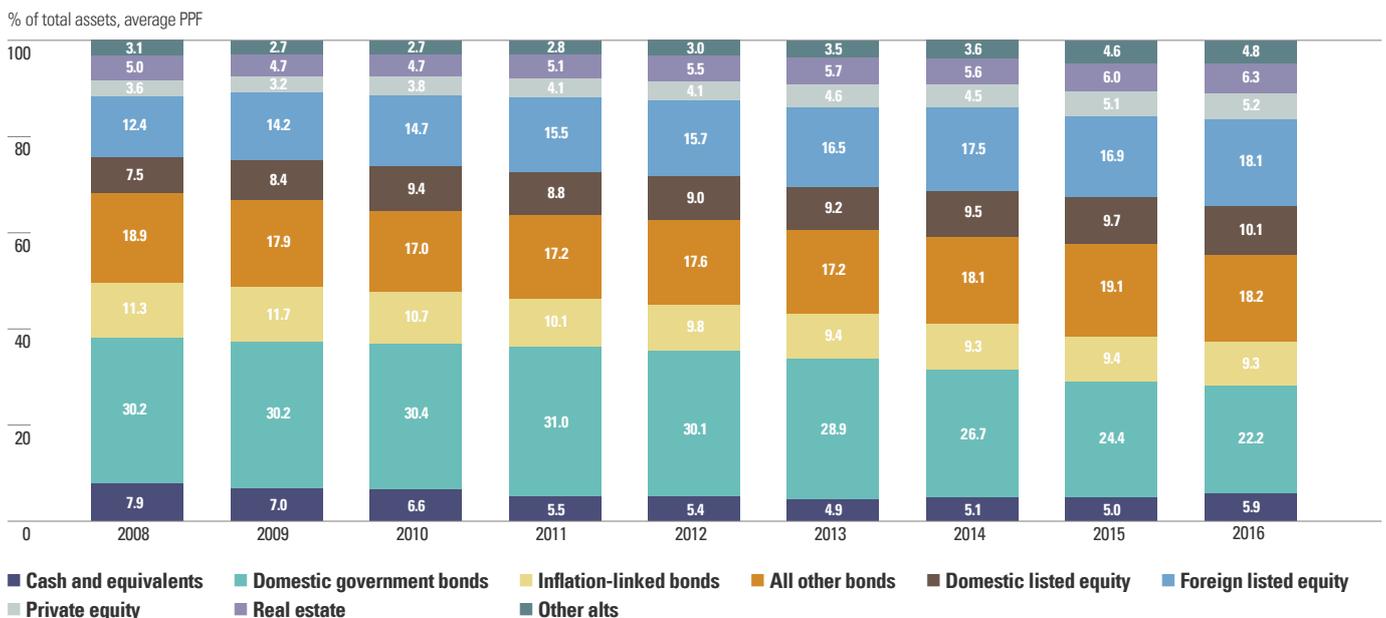
Figure 3 shows the average asset allocation of global PPFs during this period. The first notable trend in PPF allocation mirrored the broader investor community: in response to unconventional monetary policy after 2008, PPFs universally undertook a definitive shift into higher risk assets, particularly away from fixed income. In 2008, 68.3% of assets were still tied up in fixed income or cash instruments, but by 2016 that had dropped to 55.6%. Given the average covers a wide range of PPFs, this is a significant decline over a relatively short period.

The second trend has been a significant rise, on average, in both equity and alternative allocations over the period. The share of equities rose 8.3% while

alternatives added 4.6% to their share of total asset allocation. These headline numbers are subject to great variability and conceal the different starting points of risk exposure which determined the response of each individual PPF. While many funds did raise their equity exposure and some even introduced equities for the first time, certain PPFs such as the Swedish AP funds and some Canadian funds already had a high equity allocation in 2008. These latter funds raised their allocation to alternatives, partially at the expense of their equity portfolios.

The third trend, also universal, has been the greater geographical diversification of PPF portfolios. It has been most evident in the precipitous shift away from all types of domestic government bonds. While some of this shift has been towards foreign bonds, the growth rates in the foreign equity portion of portfolios have typically been higher than for domestic equities. For fixed income and equity combined, we estimate

**Figure 3: Average asset allocation<sup>5</sup> among PPFs, 2008-2016 (%)**



Source: SSGA research, based on annual reports of top 16 public pension funds, as per methodology described in Appendix 2.

that the share of domestic assets has fallen from 75% in 2008 to 65% in 2016. And while the data is less clear for alternatives, the supply constraints of domestic alternatives appear to have pushed up their share of foreign assets over the past decade.

All these trends must be viewed in the broader macroeconomic and policy context rather than as pure portfolio dynamics. Funds were not only responding to an environment of compressed bond yields, but also to changes in their supervisory frameworks, which are ultimately determined by their sponsoring governments. Within those frameworks, most PPFs gained more investment latitude over the decade, both in terms of asset classes and geography of exposures. Once PPFs were large enough to have macroeconomic significance, some host governments (e.g., in East Asia) promoted foreign asset acquisition as a means of boosting capital outflows to help mitigate currency appreciation and lessen direct central bank intervention.

In conclusion, despite their idiosyncrasies, we find that PPFs follow a largely universal, one-directional trend in their strategic asset allocation, with increased diversification in terms of asset classes and geographical exposures. In other words, most of the differences between funds may also be explained in terms of where each PPF is in their individual evolution along this trajectory. Local circumstances dictate the pace, but the ultimate asset allocation of most PPFs is likely to converge.

**“The pace of accumulation or decumulation, the strength of local capital markets and institutional capacity shape asset allocation decisions.”**

## Different Local Circumstances

Local circumstances are affected by macro and micro factors. For example, at a macro level, changing demographics may dictate a PPF’s investment approach; as Nicolas Barr noted: “accumulating assets in countries with younger populations is one way to maintain claims on future output”<sup>6</sup>. While all of the top 16 PPFs are still in their accumulation phase, some have already begun to pay out more in benefits than they receive in contributions. As such, they are focused on achieving higher returns to cover the difference.

Similarly, capital markets of the host country play a major role in shaping investment choices. PPFs in large, deep and liquid capital markets have less need to go abroad as many portfolio goals can be achieved with local instruments. At individual fund level, some PPFs have gradually become more independent of government bureaucracies, broadening their abilities to hire external managers or specialist in-house staff and boosting their investment capabilities beyond traditional domestic asset classes.

The combination of these particular circumstances results in a wide range of asset allocations beneath the over-arching trends. At one extreme, many funds have zero allocation to alternatives and perhaps still operate as a captive buyer of domestic government bonds which make up the overwhelming majority of their assets<sup>7</sup>. At the other end of the spectrum, some funds have the majority of their portfolio in higher-risk assets, viewing themselves as well suited to long-term investors who can tolerate cyclical drawdowns or higher levels of illiquidity.

## Rates of Return

The range of allocations is also reflected in the rates of return. Figure 4 shows both the average rate of return as well as the dispersion of returns across the group. Average results are better than commonly assumed, with funds generating an average 6.1% annual return in local currency terms over the 2008–2016 period. We intentionally included the crisis year 2008 in this calculation to show that average returns are not far below long-term return assumptions over the full cycle. Excluding 2008, the average rate of return has been 8.8% since 2009, well within the required actuarial range for pension fund sustainability. However, this ignores the dispersion of returns, with some funds outperforming or underperforming the average by considerable margins.

**Figure 4: PPFs’ rates of return net of fees, local currency, 2005–2016 (%)**

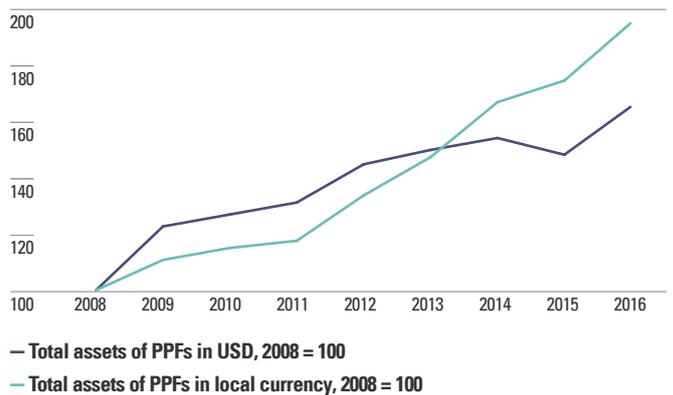


Source: SSGA research, based on annual reports of top 16 public pension funds, as per methodology described in Appendix 2. Past performance is not a reliable indicator of future results.

It is no accident that we quote the rates of return in local currency. To understand the underlying dynamics of these institutions, it is important to consider what their liabilities are. For virtually all of the pension funds, their liabilities are pension payments to domestic residents denominated in local

currency. These are usually formula-driven (as most are ultimately DB plans). Some are explicitly indexed to inflation while others are politically compelled to match it over the medium term. Equally importantly, the local currency denomination of liabilities means that funds only care about the size of their assets in domestic currency terms. This distinction was very important during the period of dollar strength between 2012 and 2016. As Figure 5 shows, while in dollar terms PPFs assets have been stagnant or even falling in some years (despite most funds accumulating healthy returns), local currency figures show that assets have grown substantially.

**Figure 5: PPF assets in local and foreign currency**



Source: SSGA research, based on annual reports of top 16 public pension funds, as per methodology described in Appendix 2.

We expect the asset allocation of the PPF sector to continue to evolve. There are still large funds, notably in Asia, with over 80% of assets in a mix of cash and domestic government bonds (real and nominal). Most of them have plans to expand into riskier and more geographically diversified assets, and some have started to do so already. Other funds have a diversified asset mix but are becoming more global. Finally, some well-diversified and mature PPFs are approaching a peak in assets and may start de-cumulating soon. In some cases, this may imply a slight reversal to domestic fixed income and a decrease in illiquid assets.

## FIXED INCOME

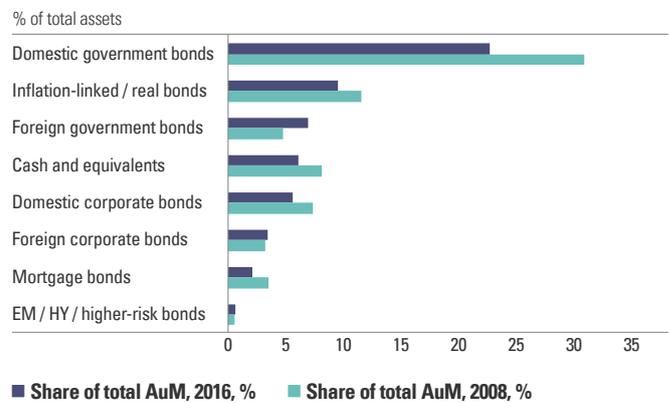
Fixed income assets play a crucial role for any pension fund, public or private, but their share of total asset allocation has varied considerably over time and across different PPFs. The assets we consider in this section are cash and fixed income. Inconsistent reporting makes cash hard to separate from fixed income, so we merge a range of assets from deposits to short-term bills into ‘cash and cash equivalents’.

There are two main reasons why PPFs require fixed income in their portfolios. First, bonds are fundamental to their asset-liability management (ALM), providing a pre-determined cash flow (subject to credit risk) to match benefit outflows, both through coupons and principal repayments. Second, they need various short-term instruments to maintain liquidity — be it to meet supervisory requirements or to account for possible variations in outflows. In addition, high-grade fixed income is important to mitigate risk in any multi-asset portfolio.

Even though the phrase ‘fixed income’ is often used to denote all types of bonds, innovations in asset allocation mean that not all PPFs think about bonds in the same way. For example, some use factor investing and group inflation-linked bonds alongside real estate, as both offer inflation management, while others think of high-yield bonds alongside equities as part of a risk budget approach.

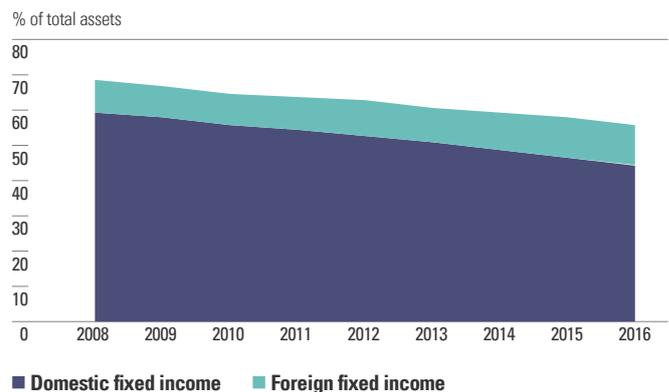
Nonetheless, we can observe some fairly robust trends across fixed income securities. Between 2008 and 2016, the share of fixed income in average asset allocations declined from 68.3% to 55.6% (see Figure 6). The decline happened every year, and of the 16 largest PPFs, only one has marginally increased its fixed income allocation over that period (from the lowest level in the sample).

**Figure 6: Average share of fixed income in PPFs’ assets, %**



Source: SSGA research, based on annual reports of top 16 public pension funds, as per methodology described in Appendix 2.

**Figure 7: Average share of domestic and foreign fixed income in PPFs’ assets, %**



Source: SSGA research, based on annual reports of top 16 public pension funds, as per methodology described in Appendix 2.

**Domestic government bonds (DGBs)**<sup>8</sup> remain the single biggest line item in the average PPF’s portfolio. For a local currency liability investor, ALM considerations underline the necessity of a liquid low-risk asset with a predictable income stream. Even highly sophisticated PPFs keep 10%–15% of their portfolio in DGBs, with the average fund holding 22%. The only type of PPF where DGBs are not crucial is a pension reserve fund which does not make regular disbursements.

Nonetheless, the decline in the share of DGBs accounted for two-thirds of the decline in fixed income, driven by PPFs that used to have extremely high allocations to the asset class – sometimes in excess of 60% – but have since reduced them to 25%–30%. There are three likely reasons for this:

- In the past, with better demographic conditions and higher interest rates, PPFs could rely on DGBs to meet their liabilities without the need for anything more sophisticated. As conditions changed, DGBs became insufficient to meet their goals.
- Previously, many governments relied on PPFs to be the default or forced buyers of their debt. Falling funding costs and a broader global investor base has reduced this reliance on PPFs.
- Equally, there has been a trend away from unfunded to funded pension systems. In theory, a PPF holding DGBs is no different from the government making a pension promise within an unfunded system. However, the explicit recognition of liabilities has positive governance effects and allows PPFs to eventually shift to other assets. Interestingly, a few large Asian PPFs still hold over 90% of their assets in DGBs and have yet to make this journey.

The shift away from DGBs is also linked to the decline in the share of inflation-linked bonds. PPFs' liabilities in local currency are often explicitly or implicitly indexed to local inflation and they need appropriate assets to match these. The bulk of real bonds on PPFs' balance sheets are issued by their domestic governments, and this could partly be attributed to the same trends as the decline in DGB allocation listed above. However, as these bonds exist to hedge a specific risk, the decrease in the holdings of real rates may also be attributed to the fall in global inflation rates in recent decades.

## Currency Risk Rather Than Credit Risk

As capital markets develop and PPFs search for premiums over government bond yields, one might expect domestic corporate bonds to attract their interest. However, the allocation to this asset class has actually fallen over the period from 7.2% to 5.5%. Many funds were not looking to replace one type of bond with another but instead moved into growth assets. Most were looking to diversify away from their domestic economy altogether. In addition, local credit spreads may not have been sufficiently attractive and not all of the PPF jurisdictions have large corporate debt markets. This is consistent with the fact that most of the reduction in allocations to domestic credit came from PPFs who held 15%–20% in 2008, while those funds with single-digit allocations did not change them significantly.

Instead of taking on additional credit risk, many PPFs chose to take on extra currency risk. As Figure 7 shows, allocations to foreign bonds have increased even as those to domestic bonds fell. Virtually all of that increase went into foreign government bonds, whose credit risk is, in most cases, the same or lower than that of the host country. These bonds are less correlated with the PPF's domestic economy as they face a different set of interest rate, growth and inflation risks, but such investment requires PPFs to undertake currency hedging. While we exclude derivatives allocations from our analysis due to accounting complexities, we observe that the use of derivatives among PPFs has increased considerably over that period, in line with the growth of foreign currency bonds.

The unwillingness to take on additional credit risk is confirmed by the insignificance of high-yield bond portfolios. While some may be counted in corporate bond portfolios due to reporting differences, we have seen no evidence of significant PPF interest in riskier bond investments. It is possible that their high correlation with equities leads PPFs to obtain the exposure to relevant risks directly through their equity portfolios.

**“Many PPFs take on extra currency (rather than credit) risk or undertake currency hedging.”**

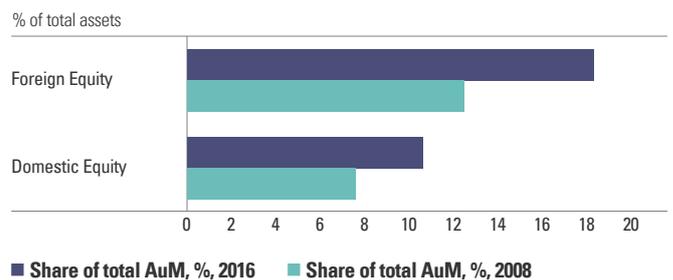
Meanwhile, in relevant markets, mortgage-backed securities (MBS) have somewhat fallen from grace. Sovereign-backed US agency debt is normally considered a government bond equivalent and is not counted here, while the private MBS market has shrunk considerably (for example, Canadian PPFs who used to buy them no longer do). Some Northern European economies have considerable local MBS markets where PPFs actively participate, but even there they have reduced their allocations as part of a broader move out of domestic assets.

The lowest share of fixed income assets in our sample is 25%, but in most cases there is an implicit ‘floor’ of 30%. Funds in jurisdictions with negative interest rates may become more relaxed about holding DGBs once the interest rate environment normalizes. However, in aggregate, we still think that the overall share of fixed income is likely to reduce further and become more diversified, as a number of key Asian funds with over 90% in fixed income have a long way to go to converge with the average PPF.

## EQUITIES

As PPFs have reduced their fixed income allocations, equities have generally benefited. The average equity share rose from 19.9% to 28.2% from 2008 to 2016, meaning that two thirds third of ‘lost’ bond allocations went into equities, largely in response to low bond yields. In this regard, PPFs responded to monetary policy signals that encouraged greater risk taking. Less intentional was the consequence that PPFs disproportionately favored foreign equities over domestic shares. Figure 8 illustrates the relative gains over that period, with domestic equities rising from 7.5% to 10.1%, while the share of foreign equities rose from 12.4% to 18.1% of the total portfolio. As with fixed income, the reasons for this also relate to the state of local capital markets. For certain PPFs, the portfolio decision of boosting equity allocation de facto meant more foreign equities as the scale of domestic markets limited the choice of suitable equities within the broader portfolio strategy. For example, Japanese equities constitute nearly half (47%) of the average Japanese PPF equity portfolio, while only 13% of the average Canadian PPF equity portfolio is held in Canadian stocks.

**Figure 8: Average share of foreign and domestic equity in PPFs’ assets, %**



Source: SSGA research, based on annual reports of top 16 public pension funds, as per methodology described in Appendix 2.

## ALTERNATIVES

Moreover, PPFs exhibit very different levels of sophistication as equity investors. By 2016, all PPFs held equities, but some had only added them as a new asset class in recent years. Equity exposure typically starts with a domestic large-cap index exposure and then gradually broadens out. In contrast, other PPFs have been investing in equities for decades, pursuing a wide mix of passive and active strategies in domestic and global markets.

Given the increased exposure to international equity markets, it is not clear how the typical PPF treats the inherent currency risk; but, as liabilities are denominated in local currency, performance measurement would need to take that into account. While we found widespread evidence of hedging activity, the data is insufficient to draw general conclusions as to whether the majority of equity investments are hedged or not.

### “The case for holding real estate has been well-established for some time.”

The future path of equity allocations is hard to predict, but growth on the scale of 2008 to 2016 may not be repeated. Although funds that reduce fixed income exposures from high levels tend to re-allocate it to equities rather than alternatives, funds that used to have equity allocations of 45%+ have now moved some of it into alternatives. The net effect of that in the coming years will depend on the speed of these adjustments across individual funds and on a multitude of tactical considerations.

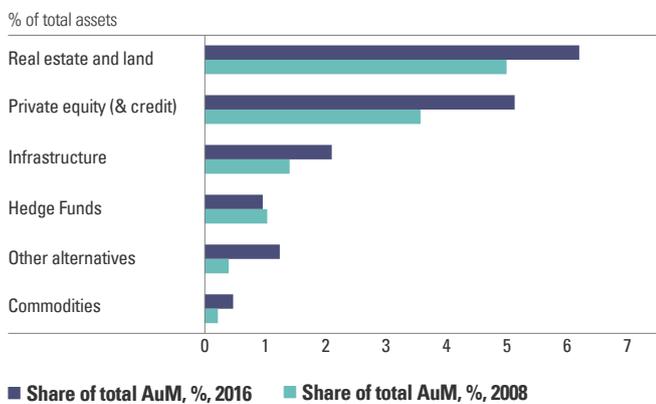
In 2016, 16.2% of the average PPF's assets were invested in alternatives. This may seem relatively low compared to other long-term institutional investors, but it has grown quite rapidly from 11.7% in 2008. As with other investors, the hunt for yield has been a strong underlying driver, which is confirmed by particularly strong growth in private equity, though real estate and infrastructure have grown as well.

Figure 9 illustrates the share of assets allocated to each individual sub-asset class in 2008 and 2016. To understand both the relative levels of exposure and their dynamics, it is important to understand their attractiveness to PPFs and their role in portfolios.

The biggest item in the average portfolio is real estate (6.3% of total AuM and 38% of all alternatives). This is not surprising as it offers investors the potential to generate higher returns and hedge their portfolio against market volatility. It provides PPFs with a steady stream of regular income and is often viewed as a hedge against inflation (PPFs which allocate assets on a factor basis group real estate with inflation-linked bonds). Some types of real estate exposures are valued less frequently and are able to maintain their market value during financial market volatility. Indeed, the case for holding real estate has been well-established for decades and many PPFs have been invested in the asset class for some time; for PPFs like AP funds it was the first alternative asset they ever invested in, partly due to the availability of vehicles such as REITs.

## How do Public Pension Funds invest?

**Figure 9: Average shares of alternatives in PPFs' asset allocation, %**



Source: SSGA research, based on annual reports of top 16 public pension funds, as per methodology described in Appendix 2.

In relative terms, however, private equity exposures have grown more significantly over the period. Private equity investments tend to generate a higher return via illiquidity premiums over public equity while still diversifying portfolio risks. They are attractive to PPFs that have the ability to take a long term investment view and can tolerate cyclical downturns. Moreover, the largest and most sophisticated PPFs can bypass private equity asset managers and engage in deals directly; even smaller funds, according to the OECD<sup>9</sup>, attempt to pool their resources and do the same.

Other alternatives account for less than a third of the total. The growth in infrastructure — theoretically a highly attractive asset class with low correlations and good income streams — was constrained by the insufficient supply of available investments. Commodities tended to attract PPFs based in commodity exporting countries, possibly due to the

availability of local investment expertise. Hedge funds, meanwhile, were the big losers of the past decade, as some PPFs reduced their allocations while other discontinued them.

Importantly, the greatest variation among PPFs is in their attitudes towards alternative investments. Of the top 16 funds analyzed in detail<sup>10</sup>, four do not invest in alternatives at all, while the top two have over 40% of their assets invested in alternatives. There are geographic differences too. While Canadian PPFs first invested in alternatives some time ago and have higher allocations today, many Asian PPFs have not started at all. This is partly due to differences in their governance frameworks — it is no coincidence that the ‘arms-length’ Canadian and Swedish funds hold higher conviction assets than funds which operate under tighter government control.

**“As PPFs increase in sophistication and expertise, they will be able to make alternative investments directly.”**

However, many PPFs are only just beginning to look at alternatives and we anticipate that investment in this asset class will grow as economies and governments evolve; PPFs searching for better returns will create more demand for such assets, while developing economies that open up to external investment will provide more supply. As PPFs increase their sophistication and expertise, they will be able to make such investments directly, bypassing intermediaries.

## CONCLUSION

The PPF sector has travelled a long way since 2008. Not only did its assets grow by 40% in dollar terms<sup>11</sup>, but many key institutions in the sector were completely re-shaped. In many cases, they began or completed the transformation from fiscal extensions of social security departments to financial institutions with substantial independent firepower and income-generating capacity. We expect funds that have started on this journey will complete it in the coming years, as operational models built around being captive buyers of government debt are not sustainable. The long-term trend towards more diversified fixed income portfolios is likely to continue, as is the shift towards taking on more risk via equity allocations, subject as ever to changes in market cycles.

Funds further along the path towards more diverse exposures may have reached the desired risk levels, but are likely to take on additional exposures to alternatives as they build up the governance capacity to handle them. Maturing funds catering for aging populations will have to make further adjustments to their asset allocations to account for changing cash flow directions and seek greater contributions and investment returns to bridge any funding gaps.

**“The long-term trend towards more diversified fixed income portfolios is likely to continue, as is the shift towards taking on more risk.”**

## How do Public Pension Funds invest?

### Appendix 1: Which Public Sector Vehicles are PPFs?

	Population coverage	Policy goals beyond providing retirement benefits	Segregation of assets from government	Possibility of liability reduction	PPF?
<b>Pension reserve funds<sup>12</sup></b> Funds set aside to fund future pension deficits	<b>High</b> — ultimately back up entire social security systems	<b>Strong</b> — long-term fiscal sustainability mission	<b>Weak</b> — operationally separate but de facto on government's balance sheet	<b>Easy</b> — liabilities arise from other parts of the pension system which the government also controls	<b>Yes</b>
<b>Social security systems</b>	<b>High</b> — majority or all of the population	<b>Strong</b> — fundamental social security mission	<b>Weak</b> — usually directly on government balance sheet and available for fiscal purposes	<b>Easy</b> — benefits often set within fiscal policy decisions	<b>Yes</b>
<b>Provident Funds</b> Funds set up by the government for employees working in private sector; may be DB/DC/hybrid	<b>High</b> — a significant category of the employed population	<b>Strong</b> — old-age security mission, albeit conditional	<b>Weak to medium</b> — greater operational independence than social security systems	<b>Possible</b> — government usually has significant control over benefit calculation rules, especially if DB	<b>Yes</b>
<b>Comprehensive public sector pension funds (ex-US)</b>	<b>Medium to high</b> — depends on jurisdiction	<b>Medium to strong</b> — enhances ability to attract labor into public sector	<b>Medium</b> — in most jurisdictions, segregated but can be changed by legislation.	<b>Possible</b> — government usually has significant control over benefit calculation rules	<b>Yes</b>
<b>Specialized pension funds for army, police, teachers and municipal employees (ex-US)</b>	<b>Medium</b> — sectors generate considerable employment but are not large in national terms	<b>Medium to strong</b> — old-age security enhances ability to attract labor into public sector	<b>Medium</b> — in most jurisdictions, segregated but can be changed by legislation.	<b>Possible</b> — government usually has significant control over benefit calculation rules	<b>Yes</b>
<b>US public sector employees funds</b>	<b>Low to medium</b> — bulk of funds are state-level so not significant in national terms	<b>Medium to strong</b> — enhances ability to attract labor into public sector	<b>Strong</b> — assets are earmarked, treatment during insolvency similar to corporate DB plans	<b>Hard</b> — relative lack of precedent and complicated legislative process	<b>No</b>
<b>Other professional / sectoral funds</b>	<b>Low to medium</b> — depends on the size of the sector	<b>Weak</b> — hard to distinguish from corporate DB plans, often co-sponsored by unions	<b>Strong</b> — usually set up and regulated like a private pension fund	<b>Hard</b> — most are similar to private pension funds	<b>No</b>
<b>State-Owned Enterprise (SOE) and municipal pension plans</b>	<b>Low</b> — size of a single SOE or municipality usually small	<b>Weak</b> — hard to distinguish from corporate DB plans	<b>Strong</b> — usually set up and regulated like a private pension fund	<b>Hard</b> — most are similar to private pension funds	<b>No</b>
<b>State-sponsored second-tier DC funds<sup>13</sup></b>	In some second-tier systems with individual accounts, the state provides a public alternative/default provider. Their assets are completely segregated and can be moved to alternative providers.				<b>No</b>

### Appendix 2: Data and Methodology

Our results are based on data published by the PPFs, with adjustments made for reporting differences and with certain extrapolations by the authors. To assess the overall PPF universe, we use the 2016 Global Public Investor (GPI) publication by OMFIF. We took all of the institutions which GPI considered to be ‘pension funds’ and filtered them in accordance with the criteria described in Appendix 1. The filtered list had \$5.9 trillion assets in 2016 and forms the basis of our study, notably for our geographic analysis.

To study the asset allocation, we looked in detail at 16 funds which together comprise roughly two-thirds of the total assets as of 2016, using the data in their annual reports. These 16 are generally the largest funds, subject to data availability (some large funds do not report asset allocation) and regional balance. In addition, five of these 16 funds comprise the bulk of the Swedish AP system, a group of distinct, legally separate funds sharing the same mandate. For the asset allocation data, they are aggregated into a single fund to maintain comparability. **All our findings refer to unweighted averages of the 12 entities (with AP funds treated as a single entity).**

The following caveats apply to the asset allocation analysis:

- The total asset numbers exclude derivatives, as these are often offset by relevant liabilities and usually constitute hedging rather than investing activities
- We sometimes *interpolate* available data points. For example, if we know the total size of the corporate bond portfolio but only know the share of foreign corporate bonds in 2010 and 2014, we assume that it changed at a linear rate in 2011-2013
- In a number of cases, we project certain data points backwards (typically for no more than 3 years). For example, if we only have the share of domestic equity in the equity portfolio from 2011 onwards, we may have assumed a constant share in 2008, 2009 and 2010

- In one case, we mapped certain unknown data points for a PPF on its peer from the same country, as they were very similar in all aspects we were aware of
- We divide all assets into 16 categories (eight in fixed income, two in equity and six in alternatives). As different funds report in very different ways, we sometimes needed to map asset classes in funds’ reports to the categories defined by authors. Asset classes with particular challenges around reporting are as follows:
  - **Inflation-linked (real) bonds** – some PPFs list their bond holdings by issuer, reporting nominal and real bonds together, while others list real bonds separately without separating them by issuer. For the avoidance of doubt, we do our best to exclude inflation-linkers from all other categories (domestic government bonds, foreign government bonds, etc.) and report them on a standalone basis
  - **Cash and cash equivalents** – this category captures a dozen different lines from PPF reports, including cash, term deposits, reverse repos, money market funds and short-term government bills
  - **High-yield bonds** – some funds report them separately while others report them within ‘foreign corporate bonds’. We did our best to estimate their amounts where possible
  - **Other alternatives** – these include both alternative assets whose nature was not specified by the issuer and those assets which cannot be placed into the other five categories (for example, certain highly specialized multi-asset instruments)

Finally, it is important to note that the data on asset allocation covers only two-thirds of the PPF industry. Its projection on the entire PPF industry is possible but should be done with caution. We reviewed, to the greatest possible extent, the miscellaneous information we had on the asset allocation of smaller funds. Generally, they tend to be slightly more aggressive than the group we reviewed. Therefore, our estimate of fixed income allocation is likely to be the upper bound for the industry as a whole while the estimate for alternatives is the lower bound.

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- <sup>1</sup> SSGA's internal calculations.
- <sup>2</sup> Willis Towers Watson (2017): Global Pension Assets Study 2017.
- <sup>3</sup> The governance structure of some Canadian funds has evolved considerably over time, as some of them have become more independent of their governments and may not strictly fall within the definition set out in Appendix 1. However, their origin is similar to other PPFs in the study and we decided to include them.
- <sup>4</sup> See SSGA (2017): Hentov E, Petrov A, Roy A 'EM Pension Systems: A Cross-Country Analysis'.
- <sup>5</sup> Unweighted average of top 16 PPFs.
- <sup>6</sup> London School of Economics and Political Science (2002): Nicholas A Barr: Reforming Pensions: myths, truths and policy choices.
- <sup>7</sup> See restrictions around public pension fund investments in Hentov, Elliot and Desfosses, Philippe. "Let the Savers Save Europe", November 2016.
- <sup>8</sup> Including regional government and government-guaranteed agency debt.
- <sup>9</sup> OECD (2015): Annual Survey of Large Pension Funds and Public Pension Reserve Funds — Report on Pension Funds' Long-term Investments.
- <sup>10</sup> For this statement, we consider AP funds as a single system.
- <sup>11</sup> Estimate based on 16 surveyed PPFs which together comprise 68% of the sector.
- <sup>12</sup> We only consider those funds which have flows with the main social security system. We consider long-term pools like the Australian Future Fund to be sovereign wealth funds.
- <sup>13</sup> This does not lead to the exclusion of pooled / notional DC plans among other PPF plans. Many provident funds, public sector funds and even some social security systems have DC features.

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