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To cite this article: Bruno Bonizzi, Jennifer Churchill & Annina Kaltenbrunner (2023): UK pension funds' patience and liquidity in the age of market-based finance, *New Political Economy*, DOI: [10.1080/13563467.2023.2184469](https://doi.org/10.1080/13563467.2023.2184469)

To link to this article: <https://doi.org/10.1080/13563467.2023.2184469>



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Published online: 02 Mar 2023.



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UK pension funds' patience and liquidity in the age of market-based finance

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ABSTRACT

Pension funds have often failed to meet expectations in terms of providing 'patient capital'. Explanations for this lapse have ranged over regulatory and ideational factors. We argue that a new 'impatient' phenomenon is emerging that requires further explanation: pension funds are becoming more mindful of their liquidity and collateral management, and engage in pro-cyclical investment behaviour. We show how UK pension funds have adapted their investment strategies, investing significantly in collective funds, including in foreign and in 'alternative assets', and setting aside protection assets as collateral for their derivatives and repo transactions. This behaviour has increased pension funds' exposure to and participation in liquidity spirals, forcing them to dispose of assets during crises and contributing to the overall pro-cyclicality of the contemporary market-based financial system. This was most recently highlighted by the instability of UK government bond markets in September 2022. Drawing from Minsky and the emerging literature on Critical Macro-Finance, we argue that this new pension fund behaviour is in response to structural changes in the financial markets in which they operate.

ARTICLE HISTORY

Received 30 November 2021
Accepted 10 February 2023

KEYWORDS

Pension funds; Critical Macro-Finance; patient capital; liquidity; liability-driven investment

Introduction

With over £2.5 trillion worth of assets, UK pension funds (PFs) represent one of the largest pools of accumulated wealth in Europe. Repeated policy efforts have been made to mobilise them as providers of stable sources of liquidity for financial markets and long-term financing.¹ By and large these efforts have not been successful; instead PFs have succumbed to short-term financial pressures: PFs have become more careful about the liquidity of their long-term investments, and they dispose of long-term financial assets – such as corporate and government bonds – to obtain cash during crises. This was evident in the March 2020 COVID-19 financial turmoil: rather than providing patient capital to cash-poor firms, PF participated in the 'dash for cash' to cover margin calls on their short-term positions (Bank of England 2020a, 2020b). This was again clearly shown by the turmoil in September 2022, when PF, short of liquidity, sold gilts and other assets to respond to their margin and collateral calls (Bank of England 2022, Hammond *et al.* 2022).

Existing research shows that the patience of PF as investors cannot be taken for granted and is contingent on institutional factors, such as regulation and the preferences of different actors within PF (Naczyk 2013, Datz 2014, Dixon 2014, Wiß 2015, McCarthy *et al.* 2016). In the UK, the literature has pointed to PF maturity, i.e. the increasing proportion of pensioners to active workers

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This article has been corrected with minor changes. These changes do not impact the academic content of the article.

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(Toporowski 2000, Engelen 2003), employers' unwillingness to act as a stable anchor to the PF system (Berry 2021), and – more recently – the influence of the financial industry on pension investment and funding regulation and the adoption of liability-driven investment' (LDI) (Gelepathis 2019, Mabbett 2020) 'as reasons for PF' continuing short-termism.

While all these factors form part of the causal structure governing PF behaviour, this paper argues that a key but overlooked determinant of PF's short-termism is their need to engage in liquidity management in the increasingly market-based UK financial system. We show how the market-based nature of the UK's financial system subjects PF to the time-critical liquidity pressures deriving from the rise of daily priced and collateralised financial relations. This is the case for both defined benefit (DB) and defined contribution (DC) PF.² In the case of DB PF, PFs have engaged significantly more with derivatives and repo, creating the need to hold and manage stores of liquid collateral, while DC PF rely on daily priced liquid investment funds.

In highlighting the importance of liquidity management and market-based finance for PF behaviour, our paper contributes to the growing literature on Critical Macro-Finance (CMF) (Gabor 2016, 2020, Sissoko 2019, Bonizzi and Kaltenbrunner 2020, Braun and Gabor 2020, Dutta *et al.* 2020, Pape 2020). Based on a Minskyan understanding of financial markets, this literature has articulated the key structural change in modern – financialised – capitalism as one towards market-based finance, where liquidity and asset prices are increasingly linked, not least through the collateralisation of financial relations (Gabor and Vestergaard 2018). This has produced a sharper segmentation between 'safe' assets, that guarantee access to liquidity in a downturn, and other assets that do not (Sissoko 2019, Gabor 2020). With regards to the behaviour of financial institutions, this literature has highlighted the importance of adopting a balance sheet perspective, which considers agents' interlocking asset and liability decisions and the role of funding structures for liquidity (funding liquidity).

Most recently, the CMF literature has also highlighted the rise of asset managers, which intermediate the funds of institutional investors (including PF), as dominant players in financial markets (Fichtner and Heemskerk 2020, Braun 2021). However, so far, this literature has not paid analytical attention to the investment decisions of PF: they are not clearly distinguished from other 'long pools' (Sissoko 2019, Braun 2021) and their investment is analysed at a broad macro-historical level (Braun 2022). We extend the CMF literature by showing that PFs are active financial institutions, forced to manage their funding liquidity, i.e. their ability to face their cash obligations and payments, which in turn shapes their investment behaviour in a specific way.

We document notable trends for UK PF: a greater reliance on collective investment funds; a greater attention to 'cashflow-driven' strategies within PF's bond portfolio; an increase in overseas investments, hedged through derivative instruments and finally, a greater engagement with the repo and interest rate swap markets, to hedge interest-rate and liquidity risks. These new sophisticated investment strategies rely on daily priced products and collateral. They, therefore, require a higher asset allocation to safe liquid assets (collateral) in parallel to high-risk/high-return assets and derivatives. While potentially enabling riskier long-term investments, such strategies force PF to seek cash during crises, leading them to dispose of such investments. Such disposal is also facilitated by the greater attention towards liquidity when selecting risky assets, e.g. through the usage of collective funds rather than direct investment. These trends have been accelerated by the global financial crisis since 2009.

In sum, our message is that while there may not be anything inherently impatient about PF investment behaviour, they can succumb and contribute to the short-termism and pro-cyclicality of the financial system. The UK case shows that, in addition to regulatory and ideational changes, PF short-termism can be seen in and explained by their need to engage in liquidity management practices in an increasingly market-based financial system. We show that through the adoption of new investment strategies, UK PFs have entangled themselves to the core of such a system through their usage of repos, derivatives and collective funds. As a result, their 'impatience' is manifest especially during crises as forced exit (Deeg and Hardie 2016), driven by their demand for liquidity, as testified by the recent 'dash for cash' and gilt market dysfunction. The experience of UK PF is

instructive for other countries where investment practices such as LDI or indeed pension system reforms towards DC pensions are underway. Although not explicit focus of this article, the policy context remains therefore crucial in influencing many of the trends we discuss.

The article is divided into a further four sections. The second section discusses the existing literature about the changing UK PF behaviour and motivates our contribution. The third section discusses the elements of a Minskyan/CMF framework which can be used to analyse PF rising liquidity needs in a market-based financial system. The fourth section illustrates our argument by detailing PF behaviour in the evolving UK financial system, highlighting the growing importance of liquidity management. Fifth and sixth sections provide more detailed empirical evidence on the strategies of UK PF and their implications for their 'patience'; the fifth section looks at new investments into risky assets and how they relate to liquidity practices and the sixth section looks at repo and derivatives strategies. The final section concludes.

The short-termism of PF: LDI and funding regulations

It has long been the hope in the UK that PF could step up and provide long-term finance to benefit the real economy. One of the policy objectives of the 'Wilson Committee' (*Committee to Review the Functioning of Financial Institutions, 1976-1980*) was to ensure that PF would support 'the re-industrialisation of the UK' (Wilson Committee Report 1980). The Myners (2001) Report and the Kay (2012) Review blamed the practices and short-term incentives of asset managers for apparent short-termism in UK PF investment strategies and set out recommendations to ensure long-term investment from the financial community.

Existing political economy literature has been sceptical of this political hope, offering a range of explanations for the persistent short-termism of PF. Early studies pointed to demographic transitions and increasing maturity of PF, i.e. the increasing proportion of benefit payments compared to contributions from active workers, to explain their rising need for very short-term assets (cash) (Toporowski 2000, Engelen 2003, Blackburn 2004). According to this literature, PF effectively follow a life cycle, with a large initial accumulation of assets, which UK PF mainly invested in the equity markets. This inflow was itself partly responsible for the equity boom in the 1990s, and thus the good performance of PF. However, as PF matured, they stopped committing as much of their capital to equities, and invested more heavily in bonds, which could be easily converted into cash, to reduce volatility of portfolio value. At the same time, they started investing in riskier assets to ensure high returns. As put by Engelen (2003, p. 1366) 'as pension funds mature, their need to push the envelope of existing investment norms and practices grows, resulting in increasing speculative behaviour'.

Contemporary literature has focused on the (conflicting) preferences of PF key stakeholders, most importantly employers, trade unions and governments (Macheda 2012, Naczyk 2013, 2016, 2018, Wiß 2015, McCarthy *et al.* 2016) to explain PF's investment behaviour. Here, PF asset demand depends on the competing influence of different stakeholders, given a certain macro-level institutional context, such as the degree of coordination between institutional sectors, and the influence of the financial sector as a political and institutional agent (Wiß 2015, 2019, Naczyk 2018). As McCarthy *et al.* (2016) argue, these influences and relationships are contingent on meso-level institutional factors such as specific forms of regulation, governance capacity and financing needs. These factors vary over time and space and affect the relative strength, as well as the dynamic preferences, of institutional actors, which will then shape the governance of PF and their demand for financial assets.

In the case of the UK, this more recent literature highlights a combination of important ideational pressures and political-institutional developments in the early 2000s leading to rising demand by UK PF for short-term, liquid assets, particularly government bonds. Berry (2015, 2021) argues that the lack of a stable 'temporal anchor' for pension schemes, as shown by the unwillingness of sponsors to sustain their PF and the move to DC pensions, is largely to blame for their inability to act as 'long-

term' investors. In Berry's explanation this is mainly a question of political economy: UK employers failed to stabilise PF investment horizon, in order to protect their own stability. Only full commitments by sponsors, or a higher degree of risk sharing, could provide PF with a stabilising 'anchor' and promote patient investment practices.

Other strands of the literature focus on the construction of new regulation and investment practices to explain PF 'de-risking', i.e. the shift away from equities and towards bonds (Gelepathis 2019, Mabbett 2020). These explanations can be summarily captured by the rise of the LDI paradigm, according to which the ultimate goal of PF is not the pursuit of maximising returns per se, but performance against the commitments originating from pension liabilities (Bruder *et al.* 2012). The key objective of LDI is the minimisation and stabilisation of the so-called 'funding deficit', i.e. the difference between the market value of assets and liabilities – calculated as the discounted value of the future pensions to be paid. This is achieved by investing in assets that are exposed to the same changes in valuation as liabilities, e.g. changes in the interest rate.³ In practice, LDI has been implemented through a division of PF's investments between a 'protection' portfolio, which directly seeks to stabilise the funding deficit and mainly consist of government bonds supplemented by the usage of derivatives, and a 'growth' portfolio, which aims at increasing the risk-adjusted return of PF investments in the presence of rising funding deficits (Insight Investment 2020).

The existing literature sees the rise of LDI as the product of the performative and ideational role of risk management practices promoted by the financial industry which has been institutionalised through accounting and regulatory developments. From this standpoint, the widespread adoption of LDI strategies is due to the increasing 'financialisation' of PF' balance sheets, as assets and liabilities have become mark-to-market, both for financial accounting and periodic regulatory assessment, and their risks are evaluated probabilistically (Berry 2016, Gelepathis 2019, Mabbett 2020).⁴ This line of thought emphasises the constructed nature of pension investments, seeing them as the result of a process through which financial theory becomes embedded into pension policy and investment practice.

We find these arguments compelling, and key to making sense of contemporary PF developments as outlined below. However, existing explanations – by focussing exclusively on the interests of different stakeholders and regulation – have insufficiently focussed on the *structural* factors that shape and constrain PF investment. As we will show in the fifth section, structural changes in investment behaviour have been accelerated by the global financial crisis in 2009, despite stability in the regulatory framework. As argued by Braun (2022), existing meso-level explanations need to be complemented with *macro*-level explanations, focussing on the structure of the financial system as a whole. At the same time, these structural changes need to be rooted in the concrete practices and constraints that different types of financial actors face. This paper provides such a macro-financial structural explanation and shows that UK PF's rising demand for short-term liquid assets originates, to a large extent, from their need to engage in active liquidity management practices in the UK' increasingly market-based system, characterised by the rise of collateralised financial relations. Thus, while PFs are in principle patient investors, their embeddedness into market-based financial structures makes it increasingly difficult for them to put their principles into practice.

Before proceeding an observation is in order. PFs have always had to manage their liquidity. Our motivation to renew focus on this is that there is a qualitative and quantitative change with regards to recent behaviour. Traditionally, PF cashflows were steady and predictable, as they consisted in contributions and pension payments. As the next sections discuss, liquidity events have been growing in frequency and importance across the financial system, due to the increasing collateralisation of financial relations. This has profoundly affected PF by adding a degree of unpredictability to their cashflows, requiring more careful liquidity management. There is therefore a need to empirically document and provide a theoretical interpretation of this. We turn to the latter in the next section.

A Minskyan/CMF framework to analyse PF behaviour

At the core of Minsky's analysis of economic dynamics stand the binding pressures created by agents' liabilities in the course of the business cycle (Minsky, 1975, 1982, 1986). Minsky characterised modern capitalist economies as a set of balance sheets, representing claims of economic actors on each other, which need to be settled as cash payments. Economic units must ensure that the cash inflows generated by their assets are sufficient to pay off their obligations, otherwise their very 'survival' is in question (Mehrling 2001). In this Minskyan world, liquidity is not just a property of an asset itself, but becomes defined vis-à-vis an agent's ability to meet its outstanding obligations with such an asset, i.e. their funding liquidity (Minsky, 1975).

CMF scholarship, which draws significantly on Minsky's framework, is fundamentally concerned with this issue at the systemic level. At the core of its research agenda is the analysis of interlocking balance sheets of different types of actors, in particular their liquidity needs and how these are managed and governed in different markets (Dutta *et al.* 2020). These interlocking balance sheets, in turn, create a hierarchy of assets depending on their ability to meet financial institutions' hierarchically placed liability structures (ultimately determined by their access to 'cash', i.e. central bank money) (Gabor 2020, Pape 2020).

CMF scholarship also highlights how the structure of interlocking balance sheets and cashflows have fundamentally changed in recent decades, as a result of a progressive 'Americanisation' of finance, where the institutional structure and practices of US financial markets are adopted across the globe (Konings 2007, Gabor 2020). In such a 'modern' market-based financial system, lenders shift risks to borrowers by demanding safe-asset collateral for their liquidity advances, thus making access to liquidity highly pro-cyclical, as it follows the cycle of asset prices used as collateral (Gabor and Vestergaard 2018, Sgambati 2019, Sissoko 2019). Crises periodically manifest themselves as liquidity spirals, where a fall in asset prices and the associated increase in 'haircuts' demanded on collateral makes access to liquidity much harder. As a result, financial markets become segmented into assets which can provide immediate liquidity if needed, and those which do not. This is because – as Sissoko (2019, p. 327) argues – 'only a very select group of assets maintains its value during a liquidity event'. Government bonds (and US treasury at the global level) generally fulfil this purpose, as their value remains relatively stable during liquidity crises, which means they continue to fulfil their role as collateral.

More recently, CMF have emphasised the growing role of non-bank financial institutions, particularly the large asset managers, as dominant players in market-based financial systems (Fichtner and Heemskerk 2020, Braun 2021). As highlighted by this literature, asset managers manage the funds of large institutional investors, such as PF. However, due to the novel nature of this literature, so far these institutional investors have received little analytical attention as financial actors in and of themselves. In a recent paper, Braun (2022) notes the role of PF in fuelling the growth of asset managers, yet his analysis remains limited to broad historical trends, rather than the detailed analysis of PF's financial practices which we propose here. We fill this gap by providing a detailed and systematic application of the CMF principles to PF investment to provide a novel understanding of PF's short-termism.

The application of a Minskyan/CMF approach to the analysis of PF investment practices in the evolving context of market-based finance yields three key insights. The first key insight is that PF must be analysed as active financial institutions (rather than 'passive' intermediaries of pension savings only constrained by regulation), which face a survival constraint: they are obliged to pay out the benefits they promise to contributing workers as well as any other commitments they have with other financial institutions. In practice, as noted above, DB PFs have attempted to mitigate these pressures by looking after their funding levels in the context of LDI. However, while LDI strategies might be able to address funding levels, they do not directly address the increasing need of PF for (funding) liquidity, i.e. cash or highly liquid assets that can be converted into cash at any time and little loss of value. The ultimate need to settle

cash payments is an unescapable reality for PF, which necessarily focuses their attention on liquidity management.

Pension policy reforms have reinforced the importance of liquidity management for PF. Despite their semi-public task (i.e. the provision of pensions and/or provision of long-term financing), no superordinate institutional mechanism relieves the survival constraint of PF.⁵ This lack of 'lender of last resort' access forces PF to act like other non-bank financial institutions when it comes to liquidity management. For DB pensions, any shortfall in cash to meet pension payments must be met by the institution sponsoring the pension scheme. However, private-sector employers – especially, but not exclusively, in the UK – have clearly signalled their unwillingness to act as 'lenders of last resort' by closing many of their schemes to new employees, favoured by policies of pension individualisation (Berry 2021). DC pensions, by design, allow investment flexibility to individuals and no liquidity support from employers beyond contribution levels, and therefore pay even closer attention to the daily management of liquidity.

The second insight yielded by the CMF/Minskyan approach is an understanding of PF short-termism in the context of the evolution of the financial system towards market-based finance. PF operate in a system where financial relations are characterised by liquid collateral requirements, which generate 'time-critical liquidity' demands (Gabor 2020), through margin calls. At the same time, funding liquidity in this system is secured not only by holding stocks of cash-like assets, but also by reserves of good-quality collateral that can be used to obtain liquidity on demand through repos, as well as investments in collective funds that offer daily liquidity through redemption. As a result, PF asset allocation will not only reflect regulation or the preferences of institutional stakeholders, but also liquidity management considerations, i.e. the implications and role that different assets have for the funding liquidity of a PF.

The final insight of the Minskyan/CMF approach concerns the dynamic implications that the importance of liquidity has for PF asset allocation. Minsky's analysis is one where attitudes towards the survival constraint change over the course of a business cycle. After a financial crash, as asset prices fall, economic units tend to place much higher value on liquidity, and thus their preparedness for their survival constraint. Over time, however the survival constraint becomes less binding, as less liquid investment strategies are validated at the systemic level, and so is largely met by most institutions. This process induces a 'layering' of the financial system where financial innovations enhance returns and stretch liquidity by creating new asset classes, so long as their liquidity is systemically validated by the market (Neilson 2019). Eventually, when market liquidity dries up and asset prices fall, layering collapses and economic units make sharper distinctions between liquid and illiquid investments. Liquidity is therefore highly pro-cyclical and moves together with asset prices and risk-taking. As said, this link is even stronger in market-based financial systems where asset prices and liquidity are linked directly through the daily repricing of collateral.

PFs are not immune to financial investment pro-cyclicality and their asset demand responds to the liquidity cycles of finance. With each crisis, UK PFs become more mindful of their survival constraint, thus accelerating ongoing structural growth in their demand for safe assets and liquidity; but at the same time, the secular decline in bond yields pushes them to chase returns. PFs, therefore, follow the financial cycle as liquidity pours into new asset classes during booms. Paradoxically, however, these strategies further increase the liquidity risk for PF, as their success depends directly or indirectly on the maintenance of market liquidity, which, as discussed, is highly pro-cyclical. Furthermore, these strategies themselves contribute to the system's pro-cyclicality, as PFs need for liquidity becomes pro-cyclically related to asset prices.

In sum, a Minskyan framework allows us to analyse and conceptualise PF's greater attention to liquidity, leading to new forms of short-termism. To manage their increasing liquidity requirements in market-based financial structures and no direct access to lender of last resort financing, PFs need to keep a large store of liquid and daily re-priced assets (mainly government bonds) as collateral separated from the rest of their assets. Furthermore, as liquidity becomes pro-cyclical through its link to asset prices, the space to experiment with riskier strategies too becomes pro-cyclical and remains

necessarily short-term since it is contingent on the state of market liquidity. Thus, despite their nominally long-term investment horizons, PF's de facto 'impatience' reveals itself as pro-cyclicality and forced exit during crises. Even outside crises, ensuring adequate levels of liquidity among 'growth' assets might put a limit on genuine long-term and patient investments of PFs. The next section provides the evidence of such a process drawn from the specific context of the UK, home to one of the largest global PF industries.

Market-based financial structures, LDI and the need for liquidity management of UK PF

As discussed in the second section, the short-termism of UK PF has been noted by the existing literature. However, new developments relating to liquidity management require further explanation. Based on our CMF approach, we consider these new forms of short-termism, and the investment strategies that stand behind it, in the context of the evolution of the UK financial system towards an increasingly market-based system.

While a full account of the transformations of UK finance is beyond the scope of this paper, the key practices highlighted by CMF scholarship have become widespread. Since the 1980s, with the liberalisation of foreign exchange transactions, and the 'big bang' in capital markets, the UK financial system has become decisively more market-based. The City of London has become one of the most important centres of foreign exchange and derivative trading globally, while the weight of non-bank financial institutions has increased dramatically. Between 1992 and 2019, the asset management industry has expanded from 144 per cent to over 400 per cent of GDP (Investment Association 2019), notable for its \$463 billion – about 15 per cent of GDP – hedge fund sector (Preqin 2020).

Domestically, the gilt market itself has been transformed, with the creation of a repo market,⁶ a large number of primary broker-dealers and issuance through periodic auctions (Choudhry 2009, Dutta 2018, Gabor 2020). As a result, gilts have become more central to the UK financial systems as an essential form of collateral and tool of liquidity management, reproducing the segmentation in financial markets (Sissoko 2019). Consequently, maintaining the liquidity of gilts has become paramount to the functioning of the UK financial system (Bank of England 2020b, pp. 63–68). Indeed, as we will see below, it was around the gilt market that the stress in Spring 2020 originated, as investors were forced to sell them *en masse* to obtain cash to face their liability commitments.

This context is missing from the existing literature. As discussed in the second section, the existing literature focuses on (i) the de-risking process associated with LDI leading to lower equity and higher bond allocations and (ii) the increasing maturity of PF, which reduces cash inflows from active workers contributions, (Engelen 2003) to explain PF's short-term investment horizons. Figures 1 and 2 testify that these are relevant explanations: UK PF's funding deficit, that is the difference between their assets and liabilities, has increased since the early 2000s, and, at the aggregate level, PF have found themselves in a negative cashflow position from 2015.⁷

However, these explanations are missing an important part of the picture: the increasingly market-based financial system characterised by the collateralisation of financial relationships and a sharper segmentation of asset markets (Bank of England 2020b, 2021). This affects PF in two main ways. Firstly, the increasing use of derivatives and leverage strategies has significantly increased PF's liquidity needs and made them less unpredictable. This is particularly evident during moments of financial turmoil. As illustrated in more detail in fifth and sixth sections, both protection and growth strategies within LDI of DB PF entail a greater usage of derivatives, particularly foreign exchange derivatives and interest rate swaps, as well as leverage through repos. These require collateral and daily margins requirements, thus generating unpredictable and time-critical liquidity needs for PF beyond their standard pension payments (Broeders *et al.* 2021).

These liquidity considerations also apply to DC PF, which use derivatives extensively, especially in the context of increasing portfolio internationalisation (Pension Policy Institute 2021). Furthermore,

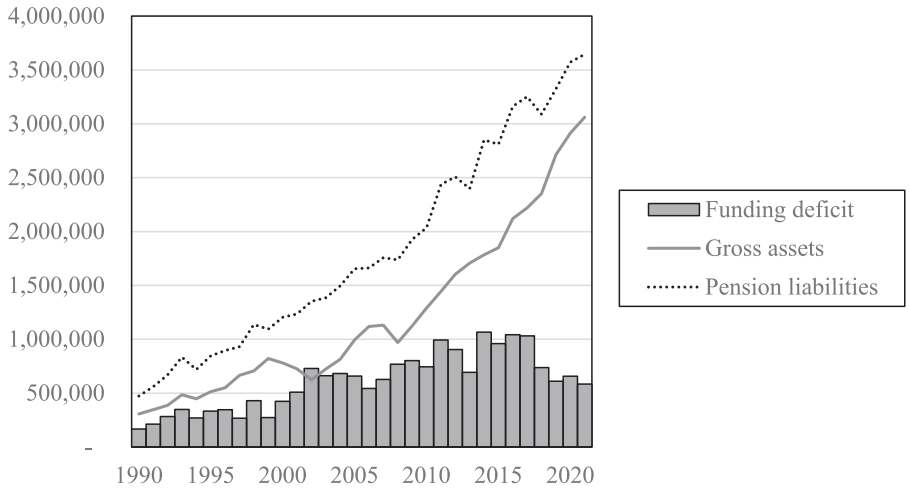


Figure 1. Pension fund assets and liabilities.

Source: Authors' elaboration of ONS – Financial Survey of Pension Schemes and UK national accounts. Data in millions of Pound Sterling.

DC schemes have specific incentives to maintain a portfolio of liquid assets. Their key objective is to keep costs low and allow flexibility – increased by the so-called ‘pension freedoms’ which allow DC PF to withdraw their funds entirely by 55 – and a degree of transparency to members (Berry 2021). Liquidity and daily pricing are paramount for DC PF to ensure that their ‘liabilities’ are constantly marked-to-market in line with the market value of assets, and quick and ‘low-cost’ changes in asset allocation can be – in principle – made by individual pension savers. This suggests that, while the impact of DC PF in terms of total pension assets in the UK is still limited, their rise might further boost the need for liquidity management practices and short-term nature of PF in the UK. This trend is therefore set to continue, as UK pension policy has moved to boost and entrench individualised DC pensions, and with that the inherent constraints in their investment strategies.

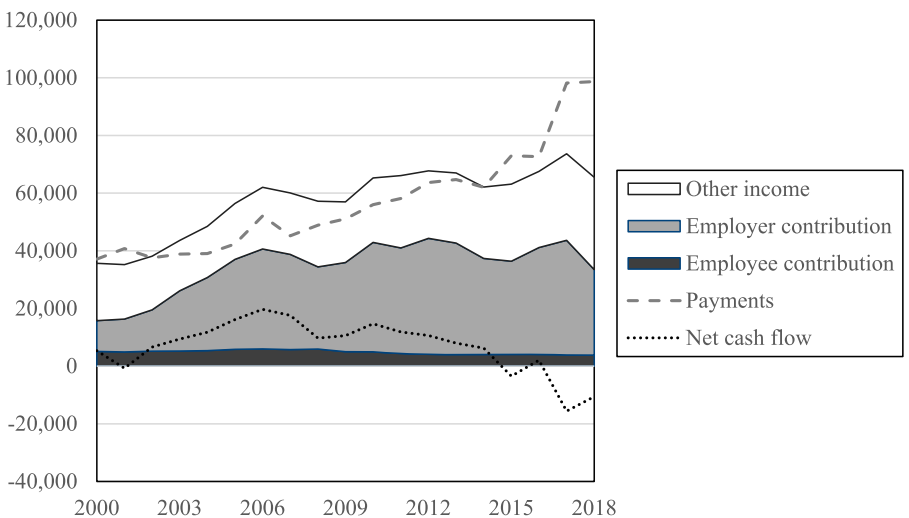


Figure 2. Pension fund cash inflows and outflows.

Source: Authors' elaboration of ONS – Financial Survey of Pension Schemes. Data in millions of Pound Sterling. Note: other income is mainly investment income. The net cashflow includes transfer payments, the net cash transfer of workers into and out of the UK PF system.

Secondly, liquidity management in an increasingly market-based financial context helps explaining UK PF changing asset allocation. The greater importance of gilts for PF is not just important for LDI protection strategies. Holding gilt reserves is necessary in modern UK financial markets, as they provide access to liquidity at all times. Gilts ensure access to liquidity because they promise predictable and safe cashflows, ease of sale *and* – crucially – they work as collateral for repo positions, and so maintain their value during a crisis. The shift towards gilts and protection assets in LDI strategies therefore must be understood not only as a response to regulatory updates and the influence of the financial industry, but a way to manage liquidity needs in a market-based system. In the words of a Director of Redington, a UK pension investment consultancy, protection assets are ‘a big pool of collateral and therefore liquidity ... a pool of gilts that you can ultimately redeem and therefore satisfy an extra cashflow’ (Portfolio Institutional 2019).

In addition to holding gilts, PF manage their funding liquidity by using collectively managed funds. Pooled funds can enhance the liquidity of their investments by relying on the additional layer of liquidity provided by asset managers. Asset managers hold cash in order to allow investors the possibility to buy or redeem shares from the fund, which is a simpler operation than buying or selling financial assets directly (Chernenko and Sunderam 2016). Even where there are restrictions on redemptions, such as in closed-end funds like private equity, a larger secondary market exists for fund shares that can allow PF to dispose more easily of an investment.

It is therefore possible to claim that the growing importance of liquidity management and the shift in the asset allocation of UK PF towards safe assets and pooled funds can be at least in part be explained by the rise of market-based finance in the UK. The segmentation of financial markets and the collateral-liquidity nexus of modern market-based finance – at the backdrop of a lack of willingness by sponsors to provide liquidity (cash) when needed and the shift to DC pensions – have led to a greater attention towards short-term liquidity management. Nevertheless, the new collateralised financial structures that PFs are embedded in, can generate liquidity pressures that can force PFs to act impatiently, by disposing long-term assets to face margin calls.

Out of all this, the UK asset manager industry stands a clear beneficiary, as they intermediate an increasing proportion of PF assets. PFs are the largest client group of UK asset managers, and have grown significantly over the past decade driven by the fast growth of LDI funds and DC schemes (Investment Association 2020). This includes some of the largest global asset managers, such as Blackrock and Legal and General, but also some more specialised UK-based organisations such as Insight Investment and Schroders (Investment Association 2020). As we will show in the next fifth section, this is also visible on PF balance sheets, as a dominant and growing proportion of their assets are invested into pooled funds.

The next two sections will provide more empirical detail about these transformations in UK PF balance sheets in the context of an increasingly financialised system. Whereas the fifth section presents empirical evidence about the new liquid asset classes that UK PFs have been investing in over the past two decades, the sixth section focuses on the reasons for PFs’ increased liquidity needs, that is the increasing use of repo and derivative strategies and their implication for systemic financial instability.

PF between returns and liquidity: gilts and asset managers

The dramatic changes in UK PF asset allocation over the past twenty years are shown in [Figure 3](#).⁸

One can observe the substantial decline in (direct) equity holding, from over 50 per cent in 2000 to under 14 per cent in 2020. In parallel there has been a marked increase in allocations to ‘funds’ from 10 per cent to over 30 per cent in 2017, with the latest ONS data show that the participation had increased to more than 50 per cent by 2020⁹ and gilts, which increased from 16 per cent to over 23 per cent in 2020.¹⁰ The structural impact of the global financial crisis is shown by the acceleration of these trends since 2009, a period with no significant regulatory change. The adoption of modern liquidity management practices, within the context of market-based finance, plays a key role in

understanding these trends. This can be seen in the larger allocation to gilts, which, as discussed in the fourth section, provide access to immediate cash if required. But even for other ‘growth’ assets, which are primarily aimed at increasing returns, liquidity considerations have become more important. This is clear when looking at three key trends.

First, as also mentioned in the fourth section and shown in [Figure 3](#), is the growth of ‘alternative assets’, through pooled funds. The results of the ONS Financial Survey of Pension Schemes and the Leverage and Liquidity Survey for the Pensions Regulator (OMB Research 2019) give a more detailed picture of the nature pooled funds.¹¹ Roughly half of PF investments were made through pooled funds. Of these about 43 per cent were allocated to ‘alternative’ assets: hedge funds, private equity, multi-asset credit, loan funds and property.¹² These represent the pursuit of higher returns, while limiting direct commitments to illiquid assets. Investments such as hedge funds increase diversification as their returns should have low correlation with traditional bonds and equities, and they allow exposure to leveraged investment strategies, which can enhance returns. At the same time, these are accessed through pooled investments, which make illiquid asset classes more liquid from the point of view of PF, thanks to redemptions and/or a liquid secondary market where shares in collective investment vehicles can be bought and sold.

The second is the rise of index funds and ETFs. More than half of pooled investments are in more conventional assets like equities (33 per cent), bonds (22 per cent) and property (5 per cent). Also important have been multi-asset funds (16 per cent as of 2021), which allow access to a variety of different asset classes – including illiquid ones such as infrastructure (PLSA 2015). A large part of pooled investments – 40 per cent based on data by the Investment Association (2020) – is in passive strategies, which include a rapidly growing market for ETFs. ETFs and index funds are especially prevalent among DC PF, which invest almost the entirety of their portfolio – over 92 per cent according to ONS data – through pooled vehicles, in a wide range of assets. Aside from their low management cost, the promise of daily redemptions represents a key attractive way to enhance the liquidity of investment strategies into both traditional and less traditional asset classes. The recent policy debate in the UK regarding establishing a Long-Term Asset Fund itself focused on the need to be open-ended and offer redemption opportunities, to encourage PF participation (Productive Finance Working Group 2021).

Finally, there has been a marked internationalisation in the assets owned by PF. ONS data shows that the proportion of overseas equities within equity allocations increased from 32 per cent to 70

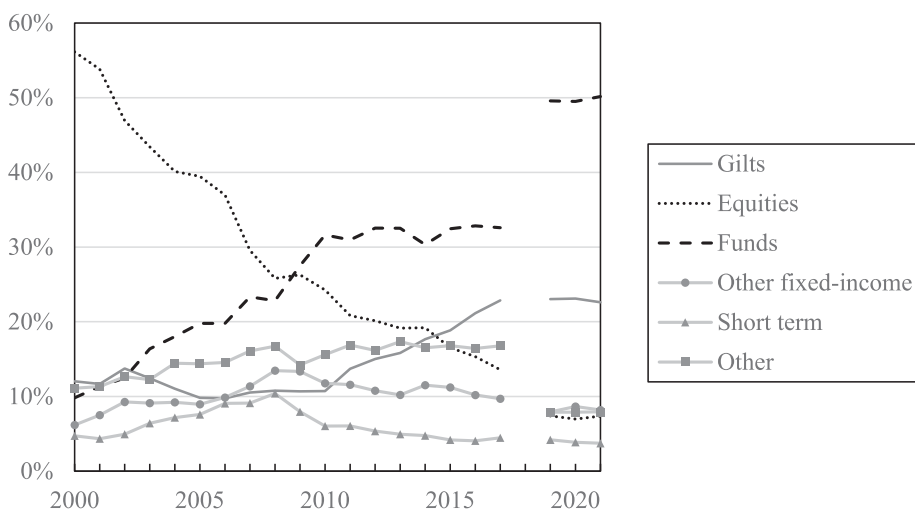


Figure 3. UK PF asset allocation.

Source: Author’s elaboration based on ONS (2019) and FSPS. Figures are expressed as percentages of total assets (net of derivatives). The 2018 gap reflects a change in the survey methods by the ONS, see endnote ix.

per cent between 2000 and 2019, and that of overseas corporate bonds increased from 34 per cent to 48 per cent¹³; as of 2019 about half of foreign assets were securities issued in the United States. Data from the Investment Association confirm the significant increase of fixed-income investment mandates dedicated to non-UK strategies from 33 per cent to over 50 per cent in the last decade (Investment Association 2019, p. 64). In part this reflects a 'search for yield', as indicated by the fact that among corporate bonds investments, about 45 per cent have a grade of BBB or lower. In part however this reflects the emergence of so-called 'cashflow-driven' investment (PLSA 2017): DB PFs seek to adopt a 'middle ground' between pure protection and growth assets, as these can provide higher returns with a fairly predictable series of cashflows. These tend to favour investments into US bonds, due to their broader and more liquid markets.

All these new 'growth' strategies, while aimed at increasing returns, are significantly shaped by funding liquidity considerations. At the same time however, and somewhat paradoxically, they expose PF to the inherent liquidity risks of market-based finance, and make PF pro-cyclical and therefore potentially unable to exercise patience during crises. Firstly, PF might struggle to liquidate these assets, as their liquidity of some of these asset classes is highly pro-cyclical. Just as ample liquidity boosts the value of assets such as corporate bonds (Shin 2013, Lo Duca *et al.* 2016), during liquidity downturns, riskier asset classes, including 'alternatives', inevitably fall in value and become much harder to sell. The additional liquidity provided by asset managers too can be ephemeral. There is evidence that funds' cash holdings might not be sufficient to cover redemption needs of investors (including from PF) in case of a crisis (Chernenko and Sunderam 2016, Douglas and Roberts-Sklar 2018). According to the FSB (2017), the 'first-mover' incentive among fund investors could potentially even create the risk of a 'run' on those funds (FSB 2017). Furthermore, while conventional funds and ETF typically use limited leverage, some of these funds – and certainly 'alternatives' like hedge and private equity funds – are highly leveraged. During liquidity downturns, access to funding liquidity might become difficult and/or much more expensive for leveraged funds, significantly reducing PF's possibility for lossless redemption and/or disposal of these funds' shares. Indeed property funds limited and delayed investor repayments due to PFs' unusually high redemption requests in Autumn 2022 (Hammond *et al.* 2022, Hickey 2022)

Internationalisation too comes with liquidity risks, as foreign investments often require hedging through derivatives. Out of the roughly £300 billion of derivative exposure by UK PF, 43 per cent are foreign currency forward contracts. While comprehensive evidence about currency exposure is not available, what exists suggests that the majority of these contracts sell USD forwards to buy GBP.¹⁴ The Triennial BIS Survey shows that about three quarters of GBP-based FX derivatives are with the USD (BIS 2019), and the financial report of BT pension scheme, the largest private-sector scheme in the UK, shows that over 74 per cent of currency forwards are purchases of GBP for USD as of June 2020 (BTPS 2020). These contracts are however typically short-term, as almost 90 per cent of currency forwards have maturities under six months. This short-term nature of derivatives exposes PF to roll-over risks. In a situation of financial market distress, PF might find it difficult to renew their forward contracts, potentially exposing them to unhedged investments. Furthermore, most of these contracts require margins, including daily variation margins, which require PF to post either gilts or cash to cover their positions depending on the value of the contract (OMB Research 2019). The need to post margins directly creates liquidity problems for PF during crises, forcing them to dispose of long-term assets and thus exerting pressure on asset prices, bond yields and the Pound Sterling (Czech *et al.* 2021a, 2021b).

This section has provided more detail on how PF new investment strategies created a tighter link between their investments and (pro-cyclical) liquidity. This has important implications for the 'patience' of PF investment. While some of these investments – e.g. 'alternatives' like private equity – could arguably be considered patient, PFs have become more mindful of their liquidity, and as such disposability, thus de facto revealing a lessened patience. This might not always be visible, but during crises, PF tap into these liquidity sources by redeeming their fund shares, as they seek cash to face their margin calls. Since pooled funds' liquidity too is negatively affected

by the pro-cyclicality of liquidity, PF can turn into sellers of long-term assets as they face liquidity calls, thus putting direct downward pressure on asset prices. We have described one primary source of these calls, i.e. foreign exchange hedging. The next section focuses on other key sources, and the role of repos in this process.

Time-critical liquidity: repos and swaps

As shown in the previous section, allocations to gilts have increased for UK PF. Aside from their interest-rate hedging role in LDI strategies, this has been a direct outcome of the rise in collateralised lending in market-based financial systems. In addition to FX derivatives, gilts have two additional key functions for PF. Firstly, they are used for leverage through repos. Traditionally, UK PFs have not used extensive leverage, despite not having stringent regulations.¹⁵ However, since 2002 leverage has increased and fluctuated pro-cyclically, reaching about 8 per cent as of the end of 2020 (Figure 4).

The vast majority of this leverage takes the form of repo borrowing. Repo borrowing allows PF to use their safe assets (mainly gilts) to gain access to additional cash, which in turn can be used to acquire other assets or more generally to settle a cash transaction. Figure 5 shows how this works.

PF borrow cash from a bank or other financial institution using gilts as collateral, with the intention of repurchasing it later at a specified price (set higher to include a return for the bank, the repo rate). The PF retains legal ownership and exposure to the underlying asset, which therefore still functions as a protection asset for the purpose of hedging interest rate risk.¹⁶ The cash acquired can be used to buy another asset to hedge their liabilities valuation risks, typically more gilts. Alternatively, it can be used to settle liquidity needs, such as a pension payment, or purchase a growth asset. The PF has therefore paid the repo rate to retain exposure to protection assets, simultaneously ‘freeing’ additional cash which can be used for other purposes.

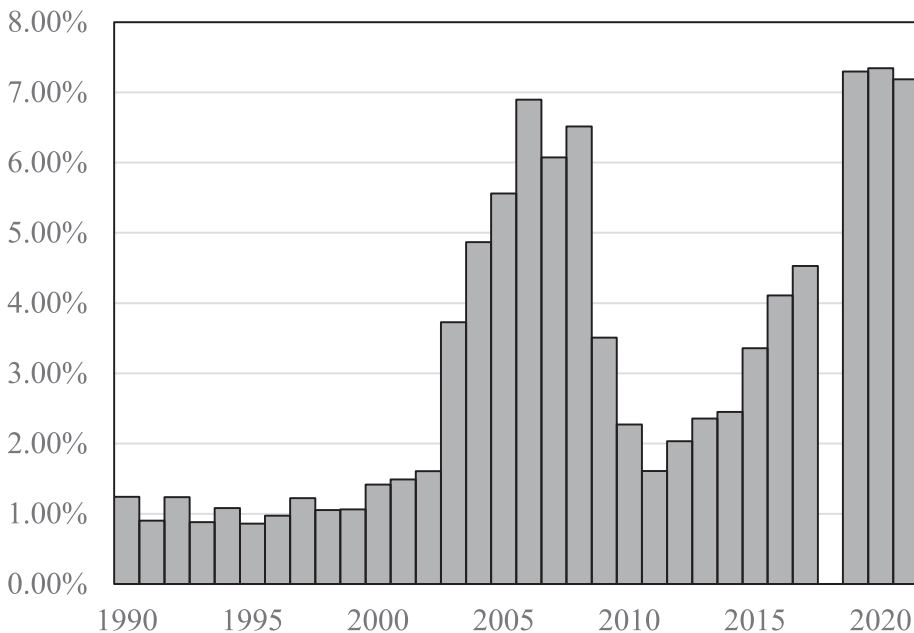


Figure 4. Pension fund leverage.

Source: ONS MQ5 and FSPS. Leverage is calculated as the sum of non-pension and non-derivative liabilities, divided by total assets. There is unfortunately no data for 2018 due to the MQ5 database being discontinued before the years of FSPS coverage.

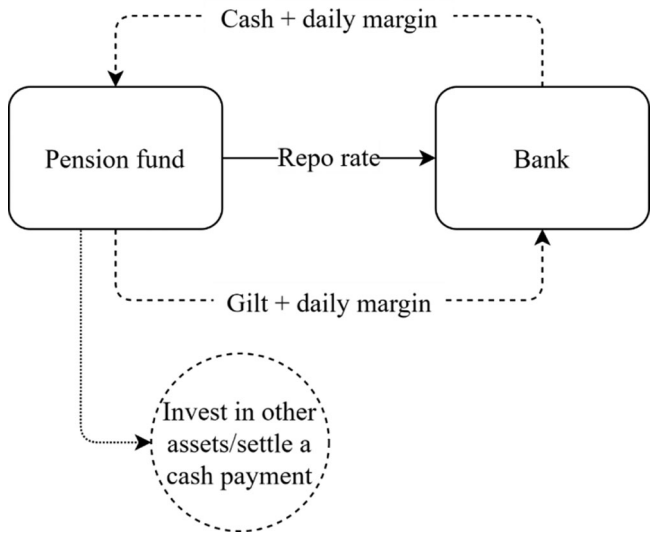


Figure 5. PF repo transaction.
Source: Authors' elaboration.

Secondly, gilts are used as collateral for interest rate swaps. As shown in [Figure 6](#), PFs have significantly increased their exposure to derivatives, especially in the 2010s. Just under half of these derivatives are currency forwards, which hedge currency risk on foreign assets for the increasing foreign asset holdings, as described in the previous section. However, an even larger proportion (more than half as of 2020) is accounted for by interest rate swaps.

These derivatives increase the interest-rate hedge on the PF portfolio, by generating fixed interest receipts in exchange for variable interest payments. [Figure 7](#) shows how it works.

In the interest rate swap, PF effectively swap interest payments with a financial institution. They pay a variable rate (e.g. the LIBOR or its recent replacement SONIA) in exchange for a fixed interest

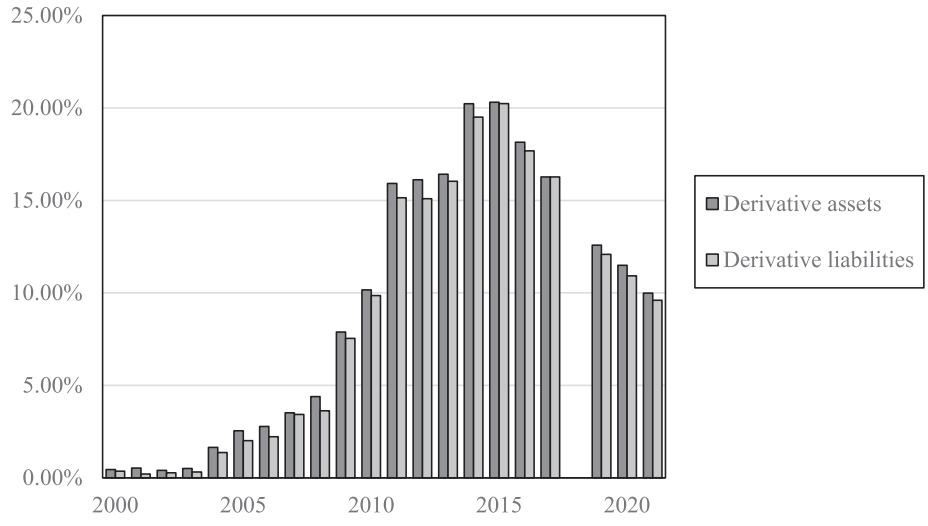


Figure 6. UK PF derivatives exposure.
Source: ONS MQ5 and Financial Survey of Pension Schemes. Figures are percentages of total assets.

payment (the Swap rate). Periodically, depending on the changes in the variable rate, the PF pay/ receive the difference between the two rates. Most sterling interest rate swaps are cleared through LCH, which requires initial margins as cash or bonds. Additionally, the swap is re-priced daily¹⁷: if the price of the swap increases/decreases, the PF will need to receive/post additional collateral to cover its margins. This solution allows the PF to have a fixed interest rate payment and thus insure itself against future changes in interest rates. It can do so in a very 'capital-efficient' way, since the swap only require potential periodic interest and collateral payments but no initial asset allocation commitment, except the initial margin.

It is evident from the example that repos and swaps are appealing complementary strategies to the new growth investments discussed in the previous section. This is because they allow PF to hedge interest rate and liquidity risk, without the need to commit too much of their assets to explicitly liquid strategies. Indeed, PFs have reduced their cash holdings, as shown in [Figure 3](#), and an increasing proportion – from 8 per cent in 2000 to 30 per cent in 2017 – is now in the form of money market funds (ONS 2019). These leveraged strategies too fuel the growth of asset managers and pooled investment funds, which amounted to about £200bn as of 2021 (Breedon 2022).

However, these strategies can also present important liquidity risks for PF. They expose them to refinancing risks through the repo market and the daily volatility of mark-to-market instruments, and consequent needs for cash to cover margins. For example, suppose that interest rates rise, and a PF is both engaged in a repo and an interest rate swap transaction. If the movement is significant enough, it forces them to post additional cash as variation margins, as the value of the bond used as collateral for the repo and the swap falls. If the PF has sufficient cash reserves this is not an issue, but otherwise the PF will be under pressure to generate additional cash through the repo market, in addition to refinancing existing repo arrangements that are coming to maturity. However, with higher interest rates, repo will be at a higher cost in the form of higher 'haircuts', i.e. the difference between the cash borrowed through the repo and the value of the collateral. Therefore, the PF can face significant short-term liquidity pressures.

Furthermore, these strategies can have systemic financial instability consequences. Firstly, PF demand for safe assets can generate pressures in particular market segments, such as the very long-end of gilt and interest rate swap markets (Greenwood and Vayanos 2010, Domanski *et al.* 2015, Klingler and Sundaresan 2019). These pressures are further compounded by the fact that, as discussed, most of these strategies are leveraged, and, significantly, many are done through pooled investment vehicles (Mercer 2020b). Secondly, and crucially, these pressures can add to liquidity spiral dynamics during market stress periods. This is what the March 2020 financial turbulence highlights. As asset prices collapsed and the Pound Sterling depreciated, so did the value of PF interest rate and FX derivative positions, triggering margin calls. PFs were under pressure to find

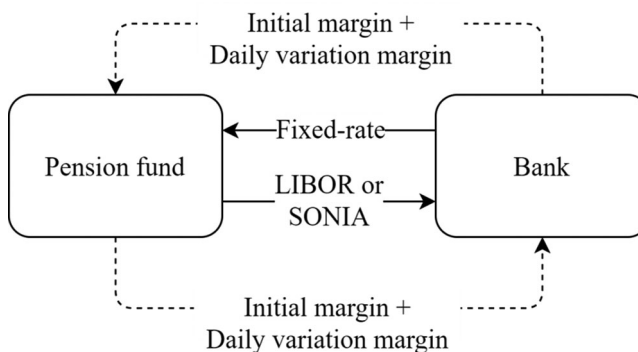


Figure 7. PF interest rate swaps.

Source: Author's own elaboration.

liquidity and a major contributor to the ‘dash-for-cash’ (Bank of England 2020a, 2020b), which propagated the liquidity stress. Similarly, in September 2022, an increase in bond yields generated margin and collateral calls of up to £70bn between 23 September and 14 October 2022, primarily from LDI funds (Bank of England 2022). To generate liquidity, PF redeemed their investments from collective funds, increased borrowing in repo markets, and sold gilts and corporate bonds, increasing pressures in these markets, that were only relieved once the Bank of England intervened.

In sum, the greater usage of derivatives and repo markets by PF is a primary cause of their increased need for liquidity management. This has forced PF to act ‘impatiently’ and dispose of long-term assets thus contributing to the downward liquidity and asset price spiral.

Conclusions

This paper draws attention to an as yet under-appreciated aspect of PF’s short-termism, that is the rise of and need for liquidity management practices that even ‘long-term’ investors such as PF adhere to, in the context of increasingly market-based financial systems. Using evidence from the UK, we have argued that PF’s liquidity demands have been driven by the daily management of collateral and the turn towards daily priced DC PF. To manage these liquidity needs, PFs keep high holdings of gilts – that can be turned into cash quickly through repo markets – as well as ensuring a higher degree of liquidity through pooled investments. While potentially enabling long-term investments in good times, these strategies turn PF into forced sellers of many asset categories during crises, thus severely constraining their ability to act as patient investors. The events of September 2022, when PF put severe downward pressure on gilt markets due to their margin calls, precipitated the intervention of the Bank of England are clear testimony to this.

While our evidence is time and space specific, the findings become if anything more relevant in the UK going forward while the trend towards DC pension schemes continues. Outside of the UK, the relevance will depend on the existence of similar financial system architecture and institutions. There are clear affinities with developments Canada and the Netherlands for example, where widespread usage of derivatives among large PF requires liquidity management and has been highlighted as a source of systemic risk during crises (Fache Rousová *et al.* 2021, Bédard-Pagé *et al.* 2021, Broeders *et al.* 2021). The transition towards DC PF and their greater reliance on collective investment funds has also been noted at the European level (Fache Rousová *et al.* 2021).

It is also important to notice that neither the trend towards DC nor the marketisation of financial systems are apolitical developments, as clearly argued respectively by Berry (2021) in relation to the individualisation of risk entailed by pension reform, and by Sissoko (2019) in relation to the ideology behind the promotion of market finance. Markets manage liquidity well only in utopian models with rational prices. There are serious questions to explore in political economy regarding the winners and losers of choices made to date, and what policy choices remain going forward. It is clear for example that the asset manager industry has both benefitted from growing asset under management from PF and is increasingly central to the market-based financial infrastructure.

Current PF developments force us to acknowledge the contradiction between the quasi-public functions ascribed to PFs, both as welfare providers and investors, and their de-facto private nature, i.e. the reality of their survival constraint. With PF being called upon to boost investment across the economy *and* ensure adequate retirement income, something somewhere will have to give. Without a change in the financial structures in which PF operate, it may be necessary to create mechanisms to reduce their focus on both funding deficits and liquidity, outside the asset allocation mechanisms prescribed by LDI and the short-term incentives of DC PF. This could be achieved partly by a greater degree of risk sharing between workers, retirees and employers, ensuring larger participation into *collective* pension schemes (Berry 2021). It would also necessitate government external guarantee to the liquidity of pension liabilities, perhaps by enhancing the role of the Pension Protection Fund. This would not only contribute to PF’s patience as investors, but would also allow them to better fulfil their essential role in social provision.

Notes

1. Recent examples include former chancellor George Osborne's Pensions Infrastructure Platform, an attempt to 'unlock' £20 billion from PF (Plimmer 2017), or Post Covid, attempts to get British pension funds to invest in 'productive' UK assets such as infrastructure or SME (e.g. through raising fee caps to allow further investment in private equity) (Thomas *et al.* 2021).
2. For occupational pensions, DB schemes contractually commit to provide members with a specific retirement income – for example 60 per cent of their final salary – once the required number of years have been worked. Contributions are adjusted to ensure the benefit can be paid, with the final responsibility falling on the employer. DC schemes only set the terms relating to the contributions to be paid in by employees and employers, with the end benefit depending on fund outcomes. This equates to a shifting of risk away from the employer and onto the member.
3. PF liabilities increase when interest rates fall, because the lower interest rate increases the present value.
4. The rise of LDI was also accompanied by both accounting and regulatory developments, which enshrined the mark-to-market nature of PF balance sheets and the centrality of 'funding deficits' (Gelepithis 2019, Mabbett 2020). The accounting standards established in 2005 forced companies to report their pension assets and liabilities at fair values, with a specified discount rate for liabilities as high-grade corporate bonds. Furthermore, since the 2004 Pensions Act PF must undergo periodic actuarial valuations (every three years at a minimum) of their asset and liabilities, and in case of funding deficits, need to present a recovery plan to full funding over a period of 10 years to a newly established Pension Regulator. Additionally, the government established the Pension Protection Fund (PPF), financed by PF themselves, which takes over the liabilities of PF whose sponsors have gone bankrupt. In general, larger 'funding deficits' can generate a higher levy from the PPF, as they are seen as implying a higher insolvency risk.
5. For bankrupt private-sector sponsors, the PPF represents an additional safety net, but its resources are limited by the levy it raises on UK PF themselves and the assets it seizes from bankrupt schemes.
6. The creation of the Sterling Repo market was created in 1997 as a way to enhance the liquidity of the Gilt market (Choudhry 2009, Dutta 2018). Repo transactions consist in the sale and repurchase of securities. It effectively works as a short-term debt secured against a collateral.
7. Disaggregated data point to a high incidence of this issue, with 73 per cent of UK PF reportedly cashflow negative as of 2019 (Mercer 2020a).
8. The next two sections primarily rely on ONS figures to explore PF asset allocation. It is important to note that DB PF remain dominant, funds still representing over 95 per cent of total assets in the ONS surveys; a proportion that has been largely unchanged over the past two decades. This is despite the fact that the proportion of employees actively enrolled in a DB scheme had declined to 35 per cent in 2019 (from 80 per cent in 2000). While the ONS only captures part of the DC PF world – specifically, it covers only so-called 'trust-based' DC PF, thus excluding 'contract-based' ones, estimates suggest that the latter are about half of total DC pension assets – this suggests that asset allocation trends remain mainly driven by decisions by DB PF.
9. The data here appear discontinuous because the ONS collects data about PF through a new survey. Beside the change in sample, which is now more representative of the PF landscape, the older dataset includes allocations to funds managed by insurance companies as part of insurance contracts, while the new dataset includes them with other pooled vehicles. These funds are particularly relevant for DC schemes.
10. These numbers are a little different than the ones shown in the Purple Book. Except from variation in survey design and sampling, this difference can be explained by the fact that the latter does not distinguish between direct and pooled investments, exclusively focuses on a subset of private-sector PF, and that total assets (the denominator of asset allocation) does not include derivatives.
11. We use ONS figures as a primary source as it is a larger-scale survey and includes public-sector PF. However, a significant allocation within pooled funds was allocated to 'others', so we complemented this with data from the survey published by the Pensions Regulator.
12. This probably underestimates the full extent of alternatives as a large 'other' assets accounted for 22 per cent and included assets such as real estate debt that would count as alternatives.
13. Unfortunately, this breakdown can only be seen for direct investments, i.e. not through pooled funds, but is still indicative.
14. The position of UK PF is similar to that of Asian pension and insurance, which has significant long positions in US bond markets, hedged through short-term derivatives.
15. Except for the local government pension schemes, which are explicitly prevented from using it (*The Local Government Pension Scheme (Management and Investment of Funds) Regulations 2009* 2009).
16. This continuing exposure is crucial for the purpose of LDI and is the key difference from the more traditional PF activity of securities lending, which while similar would imply a loss of exposure to the gilt.
17. The initial value of the swap is zero as the fixed rate is chosen to equal the expected variable rate. If the variable rate increases, the value of the swap for the PF falls, as it will now have to pay more than it receives.

Acknowledgements

The authors would like to thank Mike McCarthy, Rosie Collington and Carolyn Sissoko and three anonymous referees for the useful comments on previous versions of our paper, as well as the various participants to workshop and conferences where this paper has been presented.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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