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Quantitative tightening? Britain's 1980s experiment with overfunding

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Abstract

This paper presents the first in-depth empirical assessment of the Bank of England's 'overfunding' policy, a neglected historical episode that may offer insights about quantitative tightening. Overfunding – government bond issuance in excess of fiscal financing needs – was used as an active monetary policy tool in the early 1980s to slow money growth. Exploiting high frequency issuance announcements and a novel external instrument derived from money market segmentation, I show that overfunding shocks had countervailing effects on asset prices. Excess gilt issuance raised long-term yields, via a portfolio balance channel, but reduced short-term rates, potentially through signalling effects. These offsetting forces led to limited effects on inflation and monetary aggregates. This offers a valuable insight for policymakers now – that the different channels of quantitative tightening can be exploited to calibrate the aggregate effects of balance sheet unwind.

Key words: Quantitative tightening, balance sheet policies, bond supply, term premia, signalling, monetary targeting.

JEL classification: E44, E52, E58, G12, N14.

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Introduction

Central bank balance sheets have expanded dramatically since 2008, as central banks undertook large scale asset purchases under their quantitative easing policies. Sustained efforts to unwind those purchases began from 2022[1], so-called 'quantitative tightening'. But the symmetry of naming across these policies does not reflect a symmetry in policy intent. While quantitative easing was undertaken to further loosen financial conditions when policy rates had approached their effective lower bounds, policymakers have been clear that they are not now unwinding purchases to tighten financial conditions — Janet Yellen's (2017) 'paint-drying' analogy is only the most pithy of a large set of central bank statements in this vein.

Whether central banks are right to believe that they can unwind their asset purchases without delivering effects symmetrical to the loosening achieved under quantitative easing is therefore a question of first-order policy importance. Yet while the literature on quantitative easing is now vast (Bhattarai and Neely 2022), the literature on quantitative tightening is only slowly emerging, and the available sample of QT episodes — particularly those involving active sales — remains small. This paper asks whether that sample could be expanded by looking at a novel historical policy pursued by the Bank of England in the early 1980s, known as overfunding, and if so, what insights it might offer.

Overfunding-as-monetary policy[2] emerged through the specific logic of monetary targeting as implemented in the United Kingdom, but in its broad operation — the central bank actively supplying additional government bonds

1. The US attempt over 2017-2019 was interrupted by the COVID-19 pandemic.

2. The term itself originated as a piece of debt management jargon. Matching debt issuance precisely over time to funding needs was challenging, leading to periods where more (overfunding) or less (underfunding) financing was raised than needed in a particular period. It moved from being simply descriptive to an active policy choice in the late 1970s. Unlike overfunding, 'underfunding' never acquired policy connotations, presumably because it was never actively deployed as a deliberate policy — though Ellington, Milas and Thomas (2025) implicitly explore its implications.

into market hands while withdrawing shorter-dated liquid assets — it has a strong resemblance to quantitative tightening. Overfunding therefore has the potential to not only extend the sample of quantitative tightening episodes but also to test whether our understanding of these policies, including the channels through which they operate, is robust to very different institutional and macroeconomic contexts. While the parallels between overfunding and modern balance sheet policies have been noted previously (e.g. Allen 2012), to this author's knowledge no in-depth assessment of the policy has been conducted. This paper fills that gap.

That assessment offers four main findings. First, overfunding had clear and economically meaningful effects on asset prices. Short-term interest rates fell, long-term yields rose and corporate spreads declined. The latter two are consistent with portfolio balance effects, where markets require additional compensation, in the form of higher yields, to absorb the additional duration supplied. The decline in short rates may reflect a signalling effect, if overfunding is seen as a substitute for Bank Rate increases, or an information effect, if the Bank's choice to overfund is taken as informative about future financial conditions. Second, overfunding operated through the same transmission channels — portfolio balance and potentially signalling — that are central to modern balance sheet policies. Within the portfolio balance channel, there is clear evidence of a duration risk mechanism but limited support for local supply effects, despite the prominent role of pension funds and insurers in the gilt market at the time. Third, this constellation of asset price responses led to muted macroeconomic outcomes. Loosening from lower short-term rates was offset by higher yields at longer maturities, and there is little evidence that overfunding materially reduced either inflation or money growth. Fourth, these findings suggest that current frameworks for analysing balance sheet policies are robust to very different institutional and macroeconomic contexts.

Methodologically, this paper exploits a novel instrument derived from

the structure of the UK money market at the time. Overfunding operations drained money market liquidity; the Bank intervened systematically to alleviate these liquidity shortages, but did so in only one segment of the market — commercial bills — thereby driving a wedge between bill yields and interbank rates. In response to new issuance announcements, forward-looking markets could be expected to reprice bills relative to interbank rates to the extent that the announcement conveyed surprise information about overfunding. One day changes in this money market spread around gilt announcements are therefore informative about the surprise component of issuance associated with overfunding. This spread-based surprise measure is the core identification device in the paper: it is used as an external instrument to identify overfunding shocks in a daily frequency structural vector autoregression; it can be used to decompose the portfolio balance channel into duration risk and local supply effects; and the impulse responses obtained from the daily regression can be used to identify the macroeconomic effects of overfunding.

Beyond the limited literature on overfunding itself — Allen (2012) offers the most recent overview, while detailed contemporary accounts can be found in *inter alia* Temperton (1986) and Wormell (1985) — this paper connects to four strands in the broader literature. First, the modern literature on balance sheet policies, for which Bhattarai and Neely (2022) provides a comprehensive recent overview. Without revisiting the whole literature, several contributions are worth explicitly highlighting in this context. Vayanos and Vila (2021) provide the key theoretical reference, answering the famous observation that quantitative easing works in practice but not in theory. Their model combines a population of arbitrageurs with investors who have preferences for specific maturity ranges ('preferred habitat'). When bond supply changes, if arbitrageurs have strong risk-bearing capacity then any local effects arising from preferred habitat are spread out across the full yield curve by arbitrageurs ('duration risk shocks'); but when risk-bearing capacity is low, bond supply changes are likely to have more pronounced effects in the

vicinity of a preferred maturity segment ('local supply shocks'). Cahill et al. (2013) test this empirically for early quantitative easing episodes in the US, while Joyce and Lengyel (2024) generalise their approach to gilt issuance in a UK context; in both cases, they find strong evidence for duration risk and local supply effects. Ray, Droste and Gorodnichenko (2024) exploit the structure of US Treasury auctions to examine these effects, finding pronounced local supply effects when markets are disrupted. Lastly Ellington, Milas and Thomas (2025) take the novel approach of treating public debt sales to the banking system as a measure of UK balance sheet policies over a 60-year period — which includes the overfunding period — and find such policies are sensitive to a wide set of state contingencies.

The second strand is the emerging empirical literature around quantitative tightening. Du, Forbes and Luzzetti (2024) offer the most comprehensive assessment; their seven-country panel event-study finds that quantitative tightening increased government bond yields and steepened yield curves, with more pronounced effects under active sales — they conclude that this is more than 'paint-drying', but also not symmetrical with the easing effects that arose during asset purchases. The asymmetry of effects between quantitative easing and tightening is a prominent and unresolved theme in this literature: Lloyd and Ostry (2024) document larger effects from tightening announcements, operating through a signalling channel (announcements provide information about the expected future path of policy rates); D'Amico and Seida (2024) find bond supply effects in the US under quantitative tightening at least as large as those under quantitative easing and important interactions with the degree of interest rate uncertainty; lastly, Lu and Valcarcel (2024), building on Smith and Valcarcel (2023), even find asymmetries between quantitative tightening episodes, noting that signalling effects were prominent in the second phase of US balance sheet unwind, despite having been absent in the 2017-19 period. Kaminska, Kontoghiorghes and Ray (2025) argue that observed asymmetries in effect may result from

weaker preferred habitat effects in the period of quantitative tightening.

Third, there is a small literature that seeks to illuminate current policy challenges with historical precedents when the modern sample is limited. Most obviously, Swanson (2011) revisited the US' 1961 'Operation Twist' to assess the effects of the US' second programme of quantitative easing, launched in 2010. Operation Twist involved altering the maturity composition of publicly held government debt — issuing shorter-dated securities while purchasing longer-dated securities — with the aim of lowering longer-term yields. While earlier low frequency studies had found limited effects, Swanson (2011) deploys a high-frequency event study to show that the operation did have economically meaningful effects on yields.

The final strand centres on methodological approach. Because balance sheet policies operate primarily through asset prices, endogeneity poses a core identification challenge in their empirical assessment. A common strategy has been to isolate policy 'surprises', often exploiting unexpected announcements (e.g. Du, Forbes and Luzzetti 2024; Gagnon et al. 2011; Krishnamurthy and Vissing-Jorgensen 2011) or surveys of expectations (e.g. Cahill et al. 2013; D'Amico and Seida 2024). However, there were no explicit overfunding events nor were there surveys of relevant expectations in this period. Accordingly, this paper follows the studies that identify balance sheet policy shocks using high-frequency movements in asset prices around bond supply events, leveraging specific institutional features to isolate price changes narrowly correlated with the shock of interest: Ray, Droste and Gorodnichenko (2024) exploit the structure of regular US Treasury auctions to isolate movements in yields correlated with Treasury demand shocks; Joyce and Lengyel (2024) look at moves in yields in a narrow window around gilt issuance announcements. In this paper, the resulting series of high-frequency issuance surprises is used as an external instrument in a daily structural vector autoregression, placing it in the broader literature on monetary policy shocks identified with external instruments (see e.g. Stock and Watson 2018), as exemplified by

Gertler and Karadi (2015) for conventional monetary policy and Swanson (2021) for unconventional policy.

The paper proceeds as follows: section 1 describes the emergence of overfunding as a policy tool, how it might be thought to influence economic outcomes, both now and by contemporaries, and how it operated in practice; section 2 sets out the core empirical approach and documents the effects of overfunding shocks on asset prices; section 3 examines in more detail the channels through which overfunding affected yields, specifically duration risk and local supply effects; section 4 assesses the broader macroeconomic effects of overfunding; while section 5 concludes.

1 Overfunding in theory and practice

Overfunding emerged as a tool of monetary policy in a very different intellectual and institutional context from modern balance sheet policies. This section first contrasts contemporaries' understanding of overfunding against modern views on balance sheet policies, before discussing how overfunding worked in practice and concluding with a comparison of overfunding and quantitative tightening.

1.1 Overfunding in theory

How did a descriptive piece of debt management jargon become an instrument of monetary policy? In truth, overfunding lacked deep theoretical foundations. Instead, its role rested on two factors: first, a lack of confidence in the ability to manage inflation with policy rates; and, second, a clear accounting framework anchored in the monetary aggregates.

In the early 1970s, the collapse of the Bretton Woods system of fixed exchange rates prompted the UK to move from an exchange rate target regime to a money growth target regime, conceptually anchored in the quantity

theory of money. To a large degree, this shift reflected the authorities' difficulties in setting policy effectively in the face of large shocks — from fiscal policy and oil prices — which undermined confidence in their ability to anchor prices and inflation expectations with interest rates (Richardson 1978). Targets for money growth were set every year from the mid-1970s to the mid-1980s, anchored around a broad measure of money known as sterling M3 (£M3), whose growth was primarily determined by bank lending.

Although the debate on the best aggregate to underpin British monetary targeting was never settled — indeed, over these years fully eight different measures were officially tracked and five had explicit targets (Temperton 1986) — £M3 was the most prominent and consistently employed. In contrast to the US use of M1, £M3 was a 'broad' monetary aggregate, combining currency in circulation and deposits held at banks. This choice resulted from Britain's specific economic challenges in the 1970s; unlike a narrow aggregate, £M3 was able to provide an accounting framework that unified all of Britain's economic challenges — fiscal and balance of payments in addition to monetary (Fforde 1983).

Its ability to do this depended on what was known as the 'counterparts approach'. This framework sought to explain growth in £M3 via the banking sector's balance sheet and the public sector borrowing requirement. Full treatments are readily available (e.g. Temperton 1986; Bank of England 1984), but by replacing the liability side of the banking sector balance sheet (deposits) with assets, and in particular a detailed treatment of lending to the public sector, at its most stylised it explained money growth as:

$$\begin{aligned} \Delta \pounds M3 = &\text{ net bank lending to the public sector} \\ &+ \text{net bank lending to the private sector} \\ &+ \text{net overseas lending} \\ &- \text{increases in banks' non-deposit liabilities} \end{aligned} \tag{1}$$

Crucially, net bank lending to the public sector could be expressed as total

public sector borrowing, less the component financed by the non-bank private sector. This opened the door to debt management as a means to control money growth; increased sales of debt to the non-bank private sector would, at least in this accounting treatment, lead to reduced growth in £M3.

Strikingly, this framework, in which debt management influenced money growth which influenced inflation, had no formal role for asset prices. It is not that contemporaries thought there were no effects — as we will come onto in the following section, there were extensive debates about how overfunding might affect money market rates and there were well-established theories as to what determined the term structure of yields (Temperton 1986; Wormell 1985) — but this was not how they thought about transmission.

In contrast, modern approaches to balance sheet policies place asset prices at the heart of transmission[3]. While the full set of channels explored is rich and nuanced, two in particular have clear prominence and will be relevant to the results obtained here[4]: 'signalling' and 'portfolio balance' (Bhattarai and Neely 2022). The signalling channel captures the idea that undertaking balance sheet policies conveys a signal about future policy rates, either because it acts in some way as a commitment device ('Odyssean' guidance) or because it conveys information about potential reaction to future events ('Delphic') (Campbell et al. 2012; Krishnamurthy and Vissing-Jorgensen 2011; Bhattarai and Neely 2022). Signalling effects are expected to influence the whole term structure of rates via rate expectations and have typically been assessed with event studies centred around announcement days, looking at either short-term rates or estimates of expected rates derived from term structure models. Assessments of the signalling channel of quantitative tightening are unsurprisingly scarcer than those for quantitative easing: Du, Forbes and Luzzetti

3. Though money hasn't been completely absent from modern discussions, with e.g. policymakers sometimes framing quantitative easing in terms of its effect on the money supply. King (2009) is an early example.

4. State-contingent effects linked to financial instability or market dysfunction — including liquidity and market functioning channels — are also prominent, though less obviously relevant here, as this period didn't experience either on any scale.

(2024) find only limited effects across multiple countries, once they control for wider rates guidance; in contrast, Lu and Valcarcel (2024) find important effects for the second phase of balance sheet unwind in the US, unlike the earlier findings of Smith and Valcarcel (2023) for the 2017-19 period; and, Lloyd and Ostry (2024) find an important effect even in that earlier period. Although the Bank never made explicit overfunding announcements, overfunding could be observed in published statistics, was commented on in the financial press and was occasionally discussed in official statements, creating the potential for a signalling channel (e.g. Leigh-Pemberton 1984); in mid-1982, the Bank went so far as to state: 'In order to mitigate the effect of rapidly rising bank lending to the private sector on the growth of sterling M3, it has been necessary to sell large amounts of public sector debt to UK non-banks.' (Bank of England 1982a)

Relative to the signalling channel, the portfolio balance channel captures how investors adapt to changes in bond supply (Vayanos and Vila 2021). Investors can have preferences over specific bond maturities and a limited capacity to absorb duration risk, opening up the possibility that changes in supply affect yields through a combination of changing the availability of assets in specific maturity segments and of changing the overall amount of duration risk in market hands — effects that appear in term premia, the compensation investors require for holding longer-dated risk. In some accounts, these effects also spill over to other asset prices that might be seen as substitutes, such as equities and corporate bonds (Gagnon et al. 2011). In the case of quantitative tightening, Du, Forbes and Luzzetti (2024) only find consistently significant portfolio balancing effects in the case of active sales (as opposed to passive unwind, allowing bond holdings to simply mature without reinvestment), which lead to a steepening in the yield curve, a rise in term premia and spill overs to wider asset prices like equities and corporate bonds. Strikingly, although the jargon was different, contemporary discussions of the term structure of gilt yields appealed to the same broad factors:

rate expectations, duration risk and preferred habitat investors (Wormell 1985).

1.2 Overfunding in practice

Just as overfunding emerged in a different conceptual context, so it was implemented in a very different institutional context. That context is worth setting out in some detail, since it has important implications for the policy's effects and this paper's empirical approach. Critically, overfunding was fully integrated into regular debt management practices. There were no distinct announcements or operations; overfunding simply arose when the Bank of England, as the government's debt manager, sold more debt than the government required to finance itself. Put differently, overfunding in this period was a deliberate choice, but specific instances arose opportunistically, depending on prevailing market conditions and the authorities' ability to sell.

The market for public debt instruments was well-established and sophisticated. Its two primary instruments were shorter-dated Treasury bills (typically three-month) and longer-dated bonds, known formally as 'gilt-edged stock' and more commonly as 'gilts'[5]. Gilts were the dominant public debt instrument, accounting for the vast share of new and outstanding public borrowing; the outstanding stock of gilts was equivalent to around one third of national income. The market was considered deep and liquid, with typically over 100 individual gilts in issue in any year, at maturities averaging around twelve years but ranging up to thirty years or more, and with a diverse range of market participants (Wormell 1985).

The Bank of England was a critical participant in the gilt market. Its Issue Department was the government's debt manager, issuing debt and participating directly in the market via the government broker. The Bank's Banking Department was the government's banker, holding its accounts, in-

5. There were also more minor instruments, including savings instruments and various tax certificates, while 1981 saw the introduction of inflation-indexed gilts.

cluding the proceeds of debt sales. Private investors were diverse; insurers and pension funds were the most significant buyers of gilts, but banks, buildings societies, firms and households also made purchases. Investors accessed the market through brokers, who in turn traded in the market via 'jobbers'; brokers couldn't trade directly, nor could jobbers approach investors. This was a small community — in addition to the government broker, there were around ten dominant brokers and two main jobbers — which interacted extensively to form a tightly-knit and well-informed market (Wormell 1985).

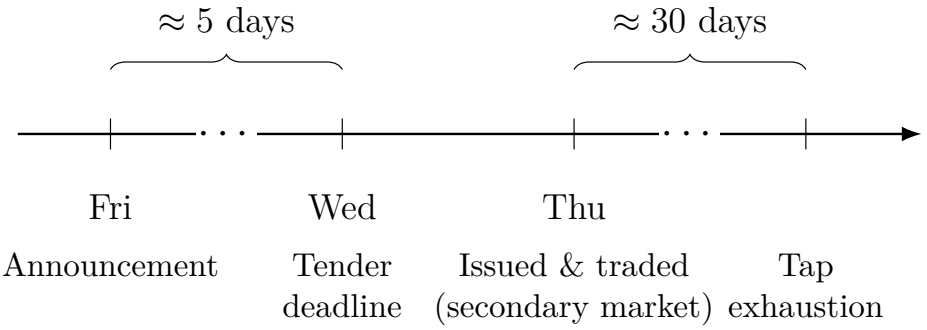

Figure 1: Stylised timeline of gilt issuance via tender and tap sales.

Issuance operated on the basis of 'tender' and 'tap'. In the classic process, illustrated in fig. 1, the Issue Department would announce a new issue to the market on a Friday afternoon[6], typically including details of the maturity, quantity and minimum tender price; a more detailed prospectus would then follow in the financial press, along with an invite to tender. Applications, covering the quantity a buyer wished to purchase and the price they would be willing to pay, had to be submitted by 10am the following Wednesday. Gilts would be allotted to the highest bidders, with the actual issue price set at the lowest accepted bid; the gilt would then be considered 'issued' and tradeable on the secondary market on the Thursday. Crucially, tenders were almost always under-subscribed, at which point the Issue Department would

6. Later in the period announcements could happen any day of the week, with Friday and Monday the most common.

purchase any unsold amounts. The Issue Department held an active portfolio of gilts (which also backed the note issue) which it sold directly into the market via the government broker when demand arose, a process known as a 'tap' sale. Increasingly in this period the tender process would be sidestepped entirely and new stock of an existing gilt would be issued directly to the Issue Department, known as a 'taplet'. With the introduction of taplets, it was increasingly common for multiple new issues to be announced side-by-side on the same day: while entirely new gilts were often announced on their own, in the core overfunding period the typical announcement involved two gilts — and some days saw up to six new issues announced side-by-side. Conventional tap stocks (including taplets) tended to sell out in a short period, with most being exhausted in around a month[7].

A tap purchase set off a complex chain of transactions, of which fig. 2 is a stylised illustration. At the outset, illustrated in the first row, the Bank of England's Issue Department backs its note liabilities with bills and gilts; the clearing bank backs its deposit liabilities with call money in the discount market (part of the money market) and reserves at the Bank of England; the discount market backs its call money liabilities with bills; and, the non-bank backs its general liabilities with deposits at its clearing bank. Acting on behalf of the non-bank, the clearing bank purchases a gilt from the Bank of England's Issue Department; while it transacts with the central bank in reserves, in practice it wants to preserve these, so having completed the transaction, it draws call money from the discount market to replenish reserves — call money holdings fall, while reserves are maintained. To meet the clearing bank's drawing of call money, the discount market sells bills. Finally, the Issue Department wishes to preserve the note issue, so must replace the sold gilt with other assets — it purchases bills from the discount market. In the final step (bottom row), the government will spend the financing raised,

7. More specialist instruments like low-coupon gilts (attractive for tax reasons) or the new index-linked gilts could take much longer to sell.

Figure 2: Stylised balance sheet transactions in response to a gilt purchase, based on the description in Wormell (1985)

replenishing deposits in the clearing bank, which will match those with call money in the discount market, which are matched with bills. The net effect is that the non-bank has acquired a gilt from the Issue Department, which has replaced the gilt with bills; other balance sheets are unchanged (Wormell 1985).

Critically, the end of this process plays out differently under overfunding. In the case of overfunding, the government didn't spend the proceeds of tap sales. Rather, it repaid outstanding short term obligations, Treasury bills and Ways and Means Advances. The result of this was to leave things as at the middle row of fig. 2 — deposits and call money weren't replenished, leading to a systematic drain of liquidity from the discount market.

Two things are worth stating explicitly at this point. First, because in its early years the funds raised were used to pay down short-term debt, overfunding didn't initially cause a change in the size of the central bank balance sheet, unlike modern balance sheet policies; this changed later in the period once the stock of Treasury Bills and Ways and Means Advances was virtually exhausted. Second, the liquidity drain led the Bank of England to increasingly intervene in the money market to alleviate shortages. At the beginning of this period it did so by buying Treasury bills, but intervention was so extensive that the supply was quickly exhausted, at which point the Bank started to buy commercial bills — by the end of overfunding it held upwards of $4\frac{1}{2}$ per cent of GDP in commercial bills (Wormell 1985; Allen 2012). These interventions led to a further distortion; in this period, the money market had begun to bifurcate, with an interbank market emerging alongside the traditional discount market. Because the Bank intervened in only one market segment, the discount market, arbitrage opportunities arose between the two, something contemporaries called 'round-tripping' (Temperton 1986).

Overfunding was most pronounced in two episodes within this period: a first episode from late-1981 to early-1982 and a second from late-1984 to early-1985. The wider policy contexts were quite distinct: in the early

phase, the economy was emerging from recession, inflation was around 12 per cent per annum, money growth was materially above target and the policy rate was on a steep downward path; in the second, output growth was soft, inflation had come down to 5 per cent per annum, money growth was in the target range and rates were rising. Each of these periods coincided with substantial bill purchases by the Bank of England and the Bank's holdings came to be known as its 'bill mountain'. These bill holdings increasingly made policymakers and markets uncomfortable, despite the Bank's attempts to defend them (e.g. Leigh-Pemberton 1984); as a result, Nigel Lawson[8] announced the end of overfunding in a 1985 speech at London's Mansion House[9]:

> Short-term considerations came to make overfunding almost a way of life. And that cannot make sense. It introduces distortions into the financial markets — not least a rapidly growing bill mountain — which are undesirable in themselves and can make policy harder to operate.
>
> Accordingly, we are no longer seeking to control the recorded growth of £M3 by systematic overfunding. [. . .] [S]hould it at any time become desirable to tighten monetary conditions, that would be achieved — and let there be no doubt about this — by bringing about a rise in short-term interest rates. The objective of funding policy is to fund the [public sector borrowing requirement] as a whole: no more, no less. (Lawson 1985)

In addition to illuminating the end of overfunding, this quote offers one other important insight: overfunding had been explicitly seen as an alternative to raising the policy rate when it came to slowing money growth.

8. Then Chancellor of the Exchequer, Britain's finance minister.

9. Alongside a broader shift to once again emphasising exchange rate considerations relative to monetary targets.

The conduct of quantitative tightening has been quite different to that of overfunding. For example, the Bank of England's[10] move to balance sheet unwind was well-telegraphed, announced in the August 2021 Monetary Policy Report (which itself was an update on a more speculative plan published in June 2018). That report articulated that the policy rate (Bank Rate) would be the preferred instrument; that unwind would begin passively once Bank Rate rose to 0.5 per cent; that active sales might be considered only once Bank Rate had risen to at 1.0 per cent; and that the overall approach to unwind would be subject to periodic review rather than adjusted meeting-by-meeting (Bank of England 2021). Detailed plans for active sales were drawn up in August 2022 and a decision to proceed was made in September 2022, supported by detailed guidance on auction design and execution (Bank of England 2022b, 2022c, 2022a). Since then, the pace and composition of sales have been reviewed annually, with auction schedules and operational details published well in advance. Throughout, these operations have taken place alongside—but operationally separate from—the UK government's debt management activities, which are conducted independently by the Debt Management Office, with coordination designed to minimise market interference (Bank of England and HM Treasury 2022; Bank of England 2022a).

Lastly, it is worth noting that overfunding and modern quantitative tightening occurred under different operational frameworks for monetary policy implementation. Overfunding was implemented alongside a scarce-reserves system with no remuneration of reserves, akin to a modern corridor-style framework. Control over very short-term interest rates (typically 1–14 days) was achieved by inducing discount houses in the money market to transact in bills at rates chosen by the Bank within an undisclosed target band (Bank of England 1982b). In contrast, quantitative tightening has operated

10. I focus on the Bank of England here, given it is one of the few central banks to pursue active sales, not just passive balance sheet unwind.

alongside abundant reserves, which were created through quantitative easing. As a result, monetary policy implementation has taken place under a floor-type system, with reserves remunerated to ensure control of short-term rates (Cavallino et al. 2025).

1.3 Overfunding and balance sheet policies compared

As will be clear from the above, overfunding has much in common with quantitative tightening, but they are not identical.

Balance sheet — Both quantitative tightening and overfunding involve increasing the supply of longer duration assets and reducing market holdings of liquid shorter duration assets. But whereas quantitative tightening involves an unambiguous contraction of the central bank balance sheet, as assets are sold and reserves cancelled, overfunding initially changed only the composition of the central bank balance sheet — and later on caused it to expand through bill purchases.

Technique — Both overfunding and quantitative tightening, at least in the UK context, involved active sales alongside regular debt issuance. That said, overfunding operations were not distinct from regular issuance, whereas modern active sales are conducted in parallel to regular issuance and by a different authority (the central bank, not the public debt management agency).

Channels: signalling — This is an important source of difference. While quantitative tightening programmes have been clearly announced, their role as an active tool of monetary policy has been explicitly downplayed. In contrast, overfunding wasn't announced at launch and its individual operations were never identified — but it was discussed as an active tool of monetary policy and could be observed ex-post in published data.

Channels: portfolio balance — Both quantitative tightening and overfunding involved increasing the duration of public debt in market hands, and both policies operated in a context where some investors plausibly had 'preferred habitats', creating the possibility of local supply effects alongside duration risk effects.

Drawing together all of the above, a clear set of hypotheses emerge that could be tested empirically:

Headline considerations — Did overfunding affect asset prices, especially yields? Did it affect macroeconomic outcomes?

Modern considerations — Through which channels did overfunding operate? Were there signalling effects? Were there portfolio balance effects, and if so, to what extent were these a result of duration risk or local supply shocks?

Contemporary considerations — Did overfunding reduce money growth? Did overfunding generate arbitrage opportunities ('round-tripping')? Was overfunding a substitute for other policy instruments (as implied in the speech cited above)?

The following sections elaborate the paper's core empirical approach, before tackling this range of topics.

2 What were the effects of overfunding on asset prices?

As with modern balance sheet policies, assessing the effects of overfunding empirically is challenging — with at least three potential sources of endogeneity, identification needs to be carefully established. This section covers the identification challenge, the empirical strategy adopted to overcome that

challenge, and the baseline results, for the effects on daily asset prices, that underpin the later sections of the paper.

2.1 Identification

Three sources of endogeneity complicate the identification of overfunding shocks. First, overfunding was just one tool of monetary policy in this period and it was jointly determined alongside the policy rate[11]. Second, the Bank was trying to achieve both monetary policy and funding objectives through gilt issuance; it couldn't force purchases or sell to specific buyers, so its issuance decisions were endogenous to wider financial conditions — and given HM Treasury approved issuance decisions, issuance announcements also risk being interpreted as signals about fiscal policy. Third, markets are forward-looking and asset prices are likely to already embody certain expectations for policy (including overfunding) at any point in time.

As already noted, this paper follows the wider empirical literature in assessing balance sheet policies by identifying policy surprises. That literature has tended to rely on surveys or surprise announcements to isolate the surprise component (e.g. Du, Forbes and Luzzetti 2024; Gagnon et al. 2011; Krishnamurthy and Vissing-Jorgensen 2011; Cahill et al. 2013; D'Amico and Seida 2024). However, those approaches are infeasible in the absence of explicit overfunding announcements and suitable surveys. Hence, this paper instead follows the literature that identifies balance sheet policy shocks using high-frequency movements in asset prices around bond supply events, offering two advantages: first, high-frequency surprises help isolate changes driven primarily by the shock of interest and accommodate the forward-looking nature of asset prices; second, specific institutional features can be leveraged to isolate price changes narrowly correlated with overfunding, rather than the other objectives noted above (e.g. Ray, Droste and Gorodnichenko 2024;

11. Known as 'minimum lending rate' in this period, but known earlier and now as Bank Rate.

Joyce and Lengyel 2024).

Specifically, this paper exploits the fact that overfunding operations required the Bank to systematically intervene in the money market, as discussed in section 1. The 1980's money market was segmented into the traditional discount market and an emerging interbank market. Because the Bank intervened in only one segment, the discount market, and because these markets were imperfectly arbitraged, the Bank's interventions depressed bill yields relative to interbank rates, an effect that was well-known to contemporaries (Bank of England 1982a; Temperton 1986; Wormell 1985). Furthermore, in this period issuance calendars weren't published in advance — so the announcement was the first specific information market participants received about the quantity of finance being raised at that point in time, as well as the coupon and maturity of any issuance.

Intuitively, to the extent that the announcement of a new gilt issue comprised surprise information about potential overfunding, forward-looking markets would adjust their pricing of bills relative to interbank rates, in anticipation of future bill demand from the Bank of England. Importantly, these effects shouldn't have arisen from news about policy rates, from which both bill yields and interbank rates were priced. Nor should they have arisen from surprise regular issuance — or indeed fiscal policy — because these wouldn't require sustained Bank of England intervention in the discount market (see fig. 2 and associated discussion). Nor indeed should they have arisen from news arising in the event window that might suggest more favourable financial conditions than otherwise. appendix A formally demonstrates that these spreads didn't widen systematically in response to monetary policy shocks, while the results in section 2 aren't consistent with spread movements reflecting changes in the fiscal stance or financial conditions.

Concretely, for each issuance announcement event, the surprise component related to overfunding is estimated as follows:

$$\text{Gross issuance}_t = \alpha + \beta\,\Delta\text{Spread}_t + \gamma Z_t + \varepsilon_t \tag{2}$$

Where: ΔSpread_t is the change in the spread between interbank rates and bill yields between close on the day before the announcement to close on the day of the announcement; and, Z_t is a vector of controls. $\beta\,\Delta\text{Spread}_t$ is therefore the surprise component of any gross issuance announcement that reflects changed expectations about overfunding. The controls employed are: change in the policy rate over the preceding week; the one-day change in the one-year ahead forward gilt yield; a flag to indicate if there was a Budget in the preceding week; the one-day change in the sterling-Deutsche Mark exchange rate[12]. In practice, the controls have little influence over the surprise estimates, consistent with the hypothesis that bill yields and interbank rates co-move in response to most shocks, with little change in spread.

2.2 Empirical strategy

Having constructed the novel instrument above, it can now be used as an external instrument to estimate the effects of overfunding shocks on asset prices in a daily-frequency structural vector autoregression.

Following the pioneering examples of Mertens and Ravn (2013), for fiscal policy, Gertler and Karadi (2015), for conventional monetary policy, and Swanson (2021), for unconventional policy, external instruments have become a prominent tool in empirical macroeconomics for identifying structural shocks in vector autoregressions (see Stock and Watson (2018) for a comprehensive overview). Intuitively, the approach builds on classic instrumental variable approaches: the shock of interest is not directly observable; another variable (the instrument) can be obtained which is correlated with that shock (the instrument is relevant) but no others in the system (the instrument is

12. The Deutsche Mark is preferred over the US dollar for measuring the exchange rate here, given its role as an official exchange rate target from 1987.

exogenous); if those conditions hold, then some part of the variation in the shock of interest will be captured by the instrument, allowing us to recover its structural effects. Practically, that means that the residual from the equation of interest from the reduced form estimation of the vector autoregression can be regressed on the instrument to isolate the variation arising from the structural shock.

2.3 Data

The baseline structural vector autoregression comprises nine economic and financial variables observed at working day frequency:

> *Gross issuance announcements* — The announced amount of issuance in £millions on the announcement date. Obtained from the Bank of England Quarterly Bulletin.
>
> *Bill stock* — £million holdings of commercial bills by the Bank of England's Issue Department. Data on money market operations were available on a daily basis from 20th August 1981 onwards, following revisions to the Bank's operating practices in the money market, and were published in the Quarterly Bulletin (Bank of England 1982b). The stock measure is constructed by aggregating purchases reported across four maturity bands (1-14, 15-33, 34-63 and 64-91 days), assuming maturities fall at the mid-point of each band.
>
> *Interbank rate* — Three-month interbank lending rate, as reported in the Bank of England interactive database[13].
>
> *Money market spread* — Calculated by the author as the difference between the three-month interbank rate and the three-month commercial bill yield (converted from reported discount rates), as reported in the Bank of England interactive database.

13. https://www.bankofengland.co.uk/boeapps/database/

Five-year spread — Spread between the five-year zero-coupon spot gilt yield and the three-month bankers' bill yield, with the spot rate obtained from the Bank of England yield curve database[14].

Fifteen-year spread — Spread between the fifteen-year and five-year zero coupon spot gilt yield, obtained from the Bank of England yield curve database.

Corporate spread — Spread between fifteen-year corporate instruments ('debentures and loans'), as measured by a Financial Times-Actuaries index, and the fifteen year zero-coupon spot gilt yield, as reported by the Bank of England.

Equities — UK equity index, the Financial Times-Actuaries Industrial ordinary shares index, a predecessor of the modern FT all-share index.

Exchange rate — Deutsche Marks per pound sterling, as reported in the Bank of England's Millennium dataset[15].

Sample — Many of these daily series are available for extensive periods, spanning the whole period of interest. However, two sources limit the feasible sample period. First, the Bank of England's yield curves are only available at a daily frequency from 1979 onwards. Second, the Bank's bill operations are only reported daily from 20th August 1981 onwards — and the stock measure constructed above requires a further 77 calendar days to fully reflect stock dynamics. Hence, for the baseline specification, the sample spans all working days from 5th November 1981 to 31st December 1985, comprising 1,066 working day observations (allowing for lags), of which 66 are days with at least one issuance announcement[16].

14. https://www.bankofengland.co.uk/statistics/yield-curves
15. https://www.bankofengland.co.uk/statistics/research-datasets
16. Impulse responses are qualitatively the same if the bill stock measure is dropped and the model estimated from January 1979.

2.4 Results

Figure 3 presents this paper's core baseline result. These impulse responses are estimated from a nine-variable, 12-lag working-day-frequency structural vector autoregression, with overfunding shocks identified using the surprise instrument constructed above. All series enter in levels, with the exception of the equity index and exchange rate, which enter in log-levels.

The first-stage F-statistic is 28.33, comfortably above the conventional rule-of-thumb threshold of 10. Impulses are normalised to a one-standard-deviation overfunding shock, which corresponds to around £100 million of issuance (for comparison, a typical new gilt announcement in this period was around £1,000 million and a taplet was £200 million).

Interpreting fig. 3, a one standard deviation overfunding surprise amounted to announced issuance of £100 million and didn't predict subsequent announcements. The bill stock rose following an overfunding surprise. And overfunding surprises saw a sharp increase in the spread in money market rates, as expected given the identification mechanism.

An overfunding shock depressed short-rates, clear from the decline in the interbank rate and from the rise of the money market spread (which implies that bill yields declined by even more than the interbank rate). That bill yields might be depressed is not unexpected; these instruments should be downwardly repriced in anticipation of future demand from Bank of England intervention. It is more of a surprise that interbank rates should fall, given overfunding was intended to explicitly tighten monetary conditions. Consistent with a decline in short rates, the exchange rate depreciated, though this effect is not statistically significant.

The rest of the yield curve behaved more in-line with expectations. The five-year spot spread over bill yields picked up, as did the 15-year spot spread over the five-year — implying a steepening in the yield curve, consistent with portfolio balance effects operating. At the long end, this steepening was enough to offset the decline in short rates, leaving longer yields somewhat

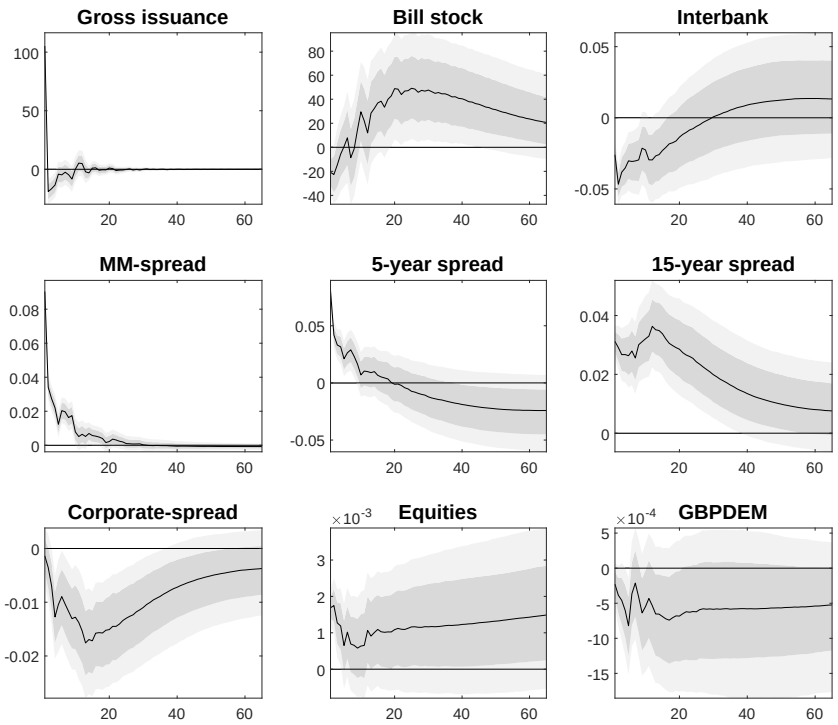

Figure 3: Impulse responses from a one standard deviation overfunding shock. Darker shaded areas correspond to 68 per cent confidence intervals; lighter shaded areas correspond to 90 per cent.

higher overall.

Overfunding shocks depressed corporate spreads and raised equity prices, though the latter is not statistically significant. The decline in corporate spreads is consistent with portfolio balance effects operating across asset classes: increased gilt issuance raises the relative scarcity, and price of, long-duration corporate instruments, compressing credit spreads.

Discussion — Several observations are worthy of further comment. First, the results here are consistent with the logic of the identification approach, in several dimensions. The profile of the increase in the bill stock is both similar in scale to the amount of issuance and peaks at around 20 working days post-announcement; these effects are clearly consistent with the need for the Bank to systematically intervene following overfunding, and the timings correspond to the typical time it would take to sell a newly issued gilt 'on tap' in the secondary market, as discussed in section 1. The fact that overfunding surprises don't predict further issuance is also powerful — it suggests that these surprises don't correspond either to fiscal shocks or an endogenous response to favourable financial conditions — in both cases, we would expect a systematic increase in issuance.

Second, the short rate result is at face value surprising. Classically, moves in expected short-rates resulting from balance sheet policies are interpreted as signalling effects. It is striking that a policy intended to tighten monetary conditions may have been interpreted as signalling lower policy rates. That said, it is possible to motivate at least two plausible explanations. First, the Thatcher government had a well-known hostility to raising policy rates — for example, in 1983 Eddie George, then a senior Bank official, observed that there was 'now considerably more pressure from [Her Majesty's Treasury] for lower interest rates, [...] partly because of the mortgage rate, and possibly partly ahead of local elections' (James 2020). Second, as the government's debt manager, one objective of the Bank was to minimise the cost of financing the government, hence the decision to issue may have signalled an

expectation from the Bank of lower rates. As Wormell (1985) observed: 'The announcement of a new issue can be greeted with relief. [...] they are the best informed participants: they know their own intentions; they may have better or more timely information [...] the announcement of an issue can have a steadying effect'. That said, a logical consequence of this argument is that overfunding surprises might beget further issuance — a result inconsistent with the issuance profile discussed above — suggesting the substitution effect might be the more plausible rationale.

Second, the result for the remainder of the yield curve is consistent with higher term premia and a portfolio balance channel — but says nothing at this stage as to the extent to which that operated through either duration risk or local supply effects, a question explored in section 3. Third, with short rates falling and long rates rising, it is unclear to what extent overall financial conditions were tightened — and so it is natural to imagine that any effects on aggregate macroeconomic outcomes, including inflation and money growth, might be muted. This topic is returned to in section 4.

3 Which portfolio balance channels did overfunding operate through?

Section 2 established that overfunding steepened the yield curve, consistent with it raising term premia via a portfolio balance channel; this section assesses which effects that portfolio balance channel operated through.

To do so, it follows Cahill et al. (2013) and Joyce and Lengyel (2024) in decomposing the portfolio balance channel into a duration risk effect and a local supply effect. As discussed in section 1, in principle, we might expect both of these to operate under overfunding: overfunding unambiguously put more duration into private hands; and, there were investors in the period with clear preferred habitats — most obviously insurers and pension funds — making local supply effects feasible. Nonetheless, theoretical and empirical

results often emphasise that local supply effects depend on constraints on the ability of arbitrageurs to absorb further risk, for example under market or financial dislocation, which was less prevalent in this period than in the modern experience of balance sheet policies (Vayanos and Vila 2021; Ray, Droste and Gorodnichenko 2024).

Teasing out the relevance of each effect requires defining proxies for duration risk and local supply shocks, each of which can be anchored in the overfunding surprise measure constructed in the previous section. Intuitively, the duration risk shock is designed to capture the effect across yields of adding duration risk into the market, with identification relying on the surprise addition. Formally, the duration risk shock to existing security j from the overfunding surprise element of the announcement of a new issue i on announcement date t is:

$$dr_{j,t} = f(d_j) \, \frac{\sum_i \, Surprise_{i,t} \, d_i}{\sum_k Stock_{k,t} \, d_k} \tag{3}$$

That is, the weighted average surprise duration (d_i) announced relative to the weighted average duration of the existing stock k of gilts in issue. $f(d_j)$ is a concave scaling function that captures the exposure of security j to changes in aggregate duration:

$$f(d_j) = \frac{1 - e^{-\gamma d_j}}{\gamma} \tag{4}$$

Here, γ controls the steepness of the concave function. Cahill et al. (2013) and Joyce and Lengyel (2024) set this value to 0.2, based on Li and Wei (2013), though Cahill et al. (2013) report a lower optimal value of 0.095 from their own estimations. Intuitively, the lower γ is, the faster the initial increase in the sensitivity of yields with respect to duration, before sensitivity flattens off; or, put differently, the higher γ is, the greater degree to which

sensitivity rises linearly with duration. Practically, a lower value of γ implies greater differentiation in sensitivity to duration between instruments with shorter durations.

The local supply shock is intended to capture the effect on individual yields that arises from the overfunding surprise in the vicinity of an instrument's maturity. Formally, the local supply effect on the yield of an existing instrument j from the overfunding surprise element of the announcement of issuance of instrument i on announcement date t is:

$$ls_{j,t} = \frac{\sum_i \delta_{i,j}\ Surprise_{i,t}}{\sum_k \delta_{k,j}\ Stock_{k,t}} \tag{5}$$

That is, the local supply shock for instrument j is the surprise i in the vicinity of j, relative to the total stock of existing issuance k that sits in that vicinity. Crucially, $\delta_{i,j}$ here is a substitutability weight, calculated as:

$$\delta_{i,j} = \max\left\{1 - \frac{|\tau_i - \tau_j|}{\theta\,\tau_i},\ 0\right\} \tag{6}$$

That is, the absolute maturity distance between i and j, relative to a maturity window around i that is θ per cent of i's maturity. Here, θ is set to 0.5, as per Cahill et al. (2013) and Joyce and Lengyel (2024). Where a maturity falls outside the 50 per cent window, it is set to zero. $\delta_{k,j}$ is the analogous weight for the maturity distance of each of the k other gilts in issue relative to instrument j.

Four subtleties are worth drawing out at this point. First, it is important to recall that these shocks are estimated at the level of the individual instrument, in contrast to the announcement surprises constructed in section 2 which are based on the aggregate announcement on any day. That poses a challenge — the change in money market spread is a response to the full set of announcements on any day — so in the event of an announcement span-

ning multiple instruments, it is unclear what weight each has in the market reaction. Here, in the event of multiple instruments being announced on the same day, the aggregate surprise is apportioned across instruments in proportion to their share of total announced issuance. Second, and relatedly, in this setting i is an announcement, not necessarily a transaction in an existing instrument — in cases where a new gilt is created, that gilt won't appear in the population k or correspond to a j; however, in the case of a taplet (which involves creating new quantities of an existing gilt), i will appear in the sample of existing gilts. Third, the *Stock* denominators here are based on the universe of gilts in issuance — in Cahill et al. (2013) and Joyce and Lengyel (2024) the denominator is restricted to bonds held outside the public sector. Data limitations mean it isn't possible to calculate such a sub-sample for this period. That said, this is also a less relevant consideration in this period, when public sector holdings of gilts were relatively steady and unimportant — unlike the early years of quantitative easing studied in Cahill et al. (2013). Finally, there is an obvious question as to whether a parameterisation of γ and θ to match modern market characteristics is appropriate for the markets of the 1980s — an issue returned to later.

The announcement-day effect on individual gilt yields of these instrument-level duration risk and local supply shocks is estimated via panel methods:

$$\Delta y_{j,t} = \beta_1 \, ls_{j,t} + \beta_2 \, dr_{j,t} + FE_j + FE_t + \varepsilon_{j,t} \tag{7}$$

That is, the one-day announcement-day t change in the yield on gilt j is a function of a local supply shock, a duration risk shock, a gilt-specific fixed effect, an announcement day-specific fixed effect and an error term. The sample covers the universe of 113 conventional gilts in issue in the period, but excludes inflation-indexed gilts, which were new and relatively illiquid in the period. The sample period is as in section 2, running from November 1981 to December 1985 and covering 144 individual gilt announcements over 66 days. Together, the sample comprises 5,402 observations. Standard errors

are clustered by gilt and event.

Before turning to results, it is helpful to illustrate these shocks during a typical issuance event. Figure 4 plots the duration risk and local supply shocks for a single announcement, 10th March 1982, against the one-day change in yields, for each of the 85 gilts in issue on that day. This day saw five taplets announced, at £100 million each and with maturity dates falling in 1992, 1994 (twice), 1995 and 1996. That leads to a local supply shock centred around the 10- to 12-year maturity point, though it's not smooth, given the maturity distribution of announced issuance. The duration risk shock rises steeply at early maturities, before levelling off at longer maturities. Perhaps most strikingly, there is a large degree of variation in yield changes — while there might be a visual correlation between yield changes and the duration risk shock, any such relationship with the local supply shock is much less evident.

Table 1 summarises the results of estimating eq. (7) under two values of θ. Consistent with the relationship that could be observed in fig. 4, the duration risk shock is correctly signed and significant, while the local supply shock has a small effect and is not significant. Overall, the within-R^2 is relatively low, suggesting that these shocks only explain a small share of the variation in yields — again, not a surprise given the noisiness of yield responses that could be observed in fig. 4. These results — significant duration risk effects and insignificant local supply effects — broadly hold across alternative calibrations of both γ and θ, though local supply effects become marginally significant (90 per cent) as θ approaches 1, i.e. with a very wide definition of local (see appendix B).

The clear implication from table 1 is that, in this period at least, the portfolio balance channel, with rising term premia following overfunding surprises, operated primarily through increases in duration rather than local supply effects. Why might that be? One possibility is that preferred habitat preferences weren't held as closely in this period as now — famously, Vay-

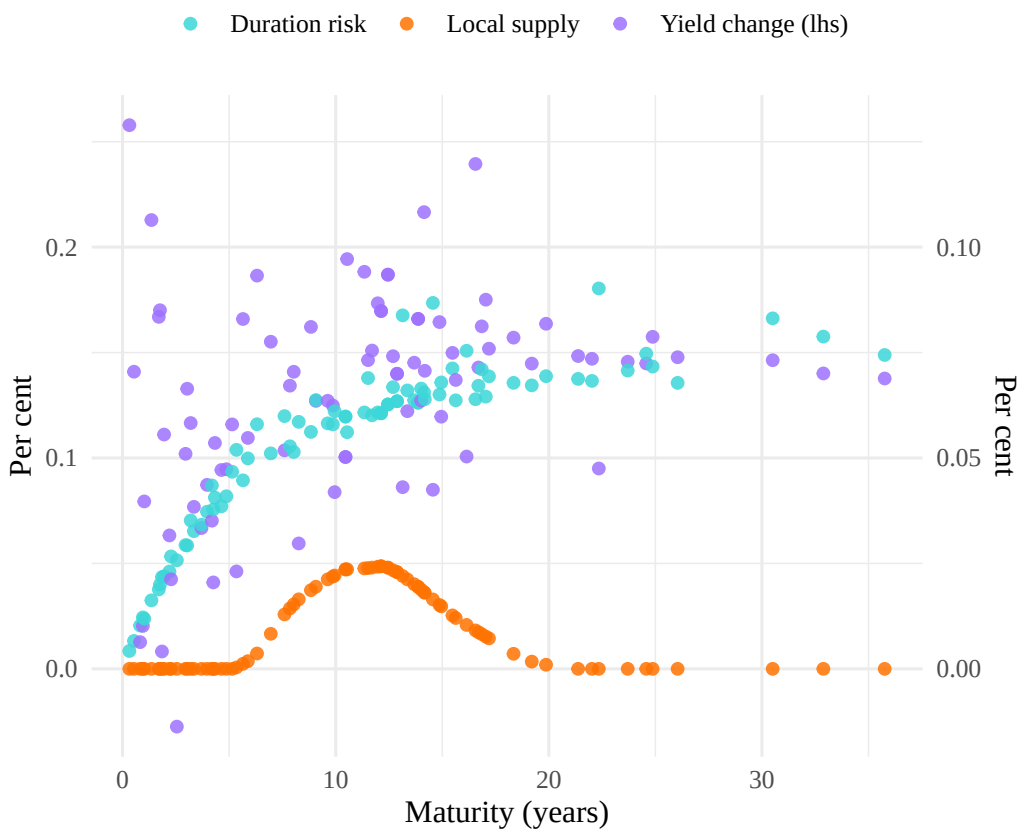

Figure 4: Example local supply and duration risk shocks (rhs) plotted against one-day yield changes (lhs), 10th March 1982.

Table 1: Duration risk versus local supply effects

	$\gamma = 0.2,\ \theta = 0.5$	$\gamma = 0.1,\ \theta = 0.5$
Duration risk	146.28 (0.014)	94.36 (0.013)
Local supply	12.74 (0.462)	17.96 (0.300)
Within R^2	0.102	0.095
Observations	5,402	5,402

Notes: The table reports coefficient estimates from the panel regression in eq. (7). p-values are reported in parentheses. All specifications include event-day and gilt fixed effects, with standard errors clustered by gilt and event. The duration-risk and local-supply shocks are constructed as in eq. (3) and eq. (5). The parameter θ is fixed at 0.5 as in Cahill et al. (2013) and Joyce and Lengyel (2024).

anos and Vila (2021) were motivated to make their canonical contribution to the theoretical balance sheet policy literature from observing the sharp change in the UK yield curve in 2004 that followed stricter requirements for pension funds to hold assets at maturities that better matched their liabilities, implying such requirements didn't exist earlier, even if there was an incentive for maturity matching (Wormell 1985). Second, it may be that the gilt market wasn't as liquid as now, introducing noise into changes in yields (as illustrated in fig. 4), reducing the power with which local supply effects might be detected. A final possibility is that local supply effects did exist, but that the conditions required for arbitrage constraints to bind didn't arise in this period — local supply effects can't be estimated here because they didn't occur in the sample period (Ray, Droste and Gorodnichenko 2024; Vayanos and Vila 2021).

4 What were the macroeconomic effects of overfunding?

Section 2 established that overfunding had mixed effects on financial conditions, lowering expected short rates but raising term premia. That begs one obvious final question — what was the net effect of these mixed influences on overall macroeconomic outcomes?

As discussed in section 1, contemporaries expected that overfunding, via an accounting identity, would reduce money growth, which in turn would reduce inflation. Modern theories emphasise transmission to inflation via asset prices; quantitative easing was expressly intended to lower yields, supporting activity and inflation — though as discussed earlier, the reverse has not been the intention with quantitative tightening, which is intended to play a more passive role (including under active sales).

From an empirical perspective, the first-best option here might be to take the instrument constructed in section 2, aggregate it to a lower frequency and deploy it as an external instrument in a monthly structural vector autoregression with the key macroeconomic time series. This approach is both attractive and feasible, but encounters three challenges. First, the instrument cannot be extended earlier than 1978 because of a lack of daily interbank lending rates — though this approach is also complicated by the fact that in this earlier period the Bank intervened by buying Treasury bills, rather than commercial bills, for which suitable yield data are also unavailable. The second challenge follows the first — the sample period at monthly frequency, from 1978 to 1985, becomes very short, particularly once allowing for the typical lag-length employed in monthly structural vector autoregressions. Third, one could in principle assert that overfunding wasn't deployed in the earlier period, and use the earlier sample period with the overfunding instrument at zero. However, this fails to reflect two important details: first, as discussed at the outset, overfunding could arise simply from the difficulty inherent in

perfectly matching financing needs and funding raised in any period, even if this wasn't a deliberate choice; second, overfunding was used deliberately in 1977-78 to sterilise foreign exchange intervention (Bank of England 1984), which it would be problematic not to reflect.

Consequently, this paper's approach is to employ the results from section 2 to craft a set of sign restrictions to identify a monthly structural vector autoregression. Sign restrictions are a well-established identification approach, following the pioneering work of Uhlig (2005); Ramey (2016) provides a useful overview. Intuitively, the approach involves estimating the reduced form vector autoregression. To recover the structural shocks, restrictions are imposed on the signs of the coefficients that map from reduced form disturbances to structural shocks. Those coefficients are then estimated and interpreted with Bayesian methods (e.g. Arias, Rubio-Ramírez and Waggoner 2018).

Table 2: Sign restrictions used to identify overfunding and monetary policy shocks

	Overfunding shock	Monetary policy shock
Gross issuance	+	
Bill stock	+	
Interbank rate	−	−
Money market spread	+	
10y–5y spot spread	+	
Corporate spread	−	
Money growth		
Inflation		+
Unemployment		−

Notes: Entries indicate sign restrictions imposed on impact (the first month of the shock).

Table 2 summarises the restrictions employed here. The model is partially identified, with a monetary policy shock identified alongside an overfunding

shock. The monetary policy restrictions are relatively standard and parsimonious: when short rates fall, inflation rises and unemployment declines — no restrictions are placed on other variables. The overfunding restrictions are derived from the results reported in section 2: the interbank rate and corporate spreads fall, while gross issuance, the bill stock, the money market spread and the 10-year-5-year gilt spread rise. Restrictions are only required to hold in the month of impact.

Data on issuance comes from the British Government Securities database[17]; the interbank rate, bill yield, gilt yield spread and 20-year corporate spread are based on the last weekly observation for each month, as reported in contemporary issues of the Bank of England's Quarterly Bulletin; £M3 growth on a year earlier, 12-month retail price index inflation and the unemployment rate are sourced from the Bank of England's Millennium dataset. The 9-variable model is estimated with six lags across the full fifteen year period of monetary targeting, 1972-1987, an interval bookended on either side by exchange-rate targeting regimes.

Figure 5 presents the impulse responses obtained from estimating a vector autoregression identified with the sign restrictions noted above. The overfunding shock has much in common with the daily results: a fall in the short-rate, a sharp increase in issuance matched by bill purchases, a rise in the money market spread and the yield-curve slope; responses are similar in both direction and magnitude. But the shock's effects on macroeconomic variables are not significant: money growth rises while inflation and unemployment decline — but none of those effects are statistically significant.

What to make of these results? Even if not statistically significant, the most result striking is the muted and positive effect on money growth, given this was the key channel for contemporaries. Overfunding, by accounting identity, was expected to reduce money growth, whereas these results might suggest that other effects, acting through the asset price channels critical

17. https://www.escoe.ac.uk/research/historical-data/fiscal-data/

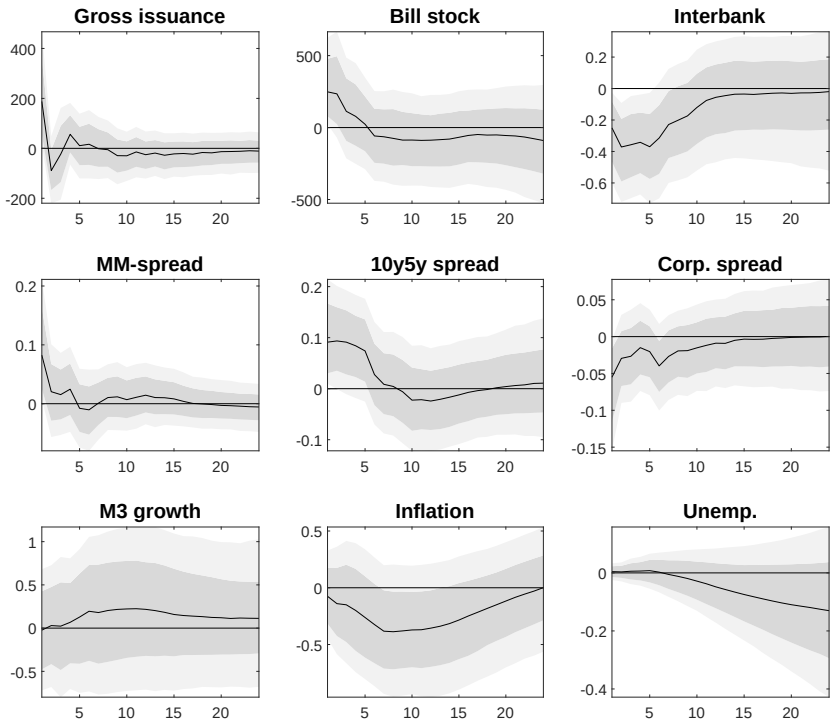

Figure 5: Monthly frequency impulse responses to a 1-standard deviation overfunding shock identified by sign restrictions. Darker shaded areas represent the 68 per cent confidence interval; lighter shaded areas 90 per cent.

to modern thinking about balance sheet policies, were providing offsetting support for money growth. And despite money growth rising, inflation actually fell in response to overfunding shocks, further raising doubts about the monetary mechanism at work here — though once again this effect is not statistically significant. Of course, the small number of observations at monthly frequency for the critical period of overfunding makes this a relatively low-powered assessment of the macroeconomic effects and it is hard to draw definitive conclusions; nonetheless, these small and insignificant effects are hardly a surprise, given the offsetting effects on overall financial conditions.

5 Conclusion

This paper set out to examine an unstudied Bank of England policy from the 1980s — overfunding — with broad similarities to quantitative tightening, asking how far that comparison might be drawn and what implications would follow. It offers four broad conclusions.

First, overfunding had empirically important effects on asset prices, but its implementation implied muted effects on macroeconomic outcomes. Specifically, the results presented in section 2 demonstrate clear and economically meaningful effects from issuance announcement surprises associated with overfunding: short rates fall, money market spreads widen, the yield curve steepens and corporate spreads narrow. Those results are consistent with a portfolio balance channel and a signalling or information effect; section 3 unpacks the portfolio balance channel, demonstrating an important duration risk effect, but finding limited evidence for local supply. Finally, given the offsetting channels identified in the daily results, it follows naturally that section 4 finds muted and statistically insignificant macroeconomic effects, including for inflation and money growth.

Second, while overfunding has important differences from modern quant-

itative tightening, there are clear similarities. Most strikingly, our modern theoretical and empirical understanding of balance sheet policies can be comfortably applied to a policy built on very different conceptual foundations and operated in a very different institutional and economic context.

Third, the experience of overfunding is informative for current central bank policies. Most notably, the finding that channels can have countervailing effects has direct relevance for current quantitative tightening. Central banks have emphasised that balance sheet unwind is not intended to act as an active policy tool; the historical evidence here illustrates how the interaction of channels can indeed lead balance sheet policies to have effects that are not straightforwardly symmetrical to those of quantitative easing.

Fourth, these findings also speak to the broader empirical literature on quantitative tightening. They underscore the importance of explicitly disentangling the channels through which balance sheet policies operate in order to understand their effects. As the time series of quantitative tightening episodes lengthens, this will become easier. But equally, meaningful variation already exists across countries in how quantitative tightening has been designed and communicated, offering valuable scope for further empirical work on the transmission and calibration of balance sheet policies.

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Appendices

A Identification cross-check: monetary policy

Identification in this paper rests on the assumption that the spread between interbank rates and commercial bill yields react systematically to overfunding surprises (relevance), but not to other shocks (exogeneity), as discussed in section 2. This appendix demonstrates that formally in the case of monetary policy shocks.

Specifically, using the same dataset, model and sample period as the results in section 2, it estimates a working-day structural vector autoregression to assess monetary policy shocks, in the spirit of Gertler and Karadi (2015). In this case, monetary policy shocks are identified by instrumenting the daily interbank rate with the narrative monetary policy shock series created by Cloyne and Hürtgen (2016), which gives a first-stage F-statistic of 70.19, well-above the rule-of-thumb threshold of 10.

Figure 6 illustrates the results. A one-standard-deviation monetary policy shock sees the interbank rate rise by around 0.1 percentage points; sterling appreciates, corporate spreads rise somewhat and equities fall — all of which is symmetrical with an overfunding shock, as well as being somewhat larger and, in the case of the exchange rate and equities, of clearer statistical significance. The yield curve also flattens marginally; at face value that might again appear symmetrical with an overfunding shock, but the effects are notably smaller, especially given the larger move in the short-rate. Lastly — and most critically here — moves in the money market spread are small and noisy, without any systematic move wider or narrower, while issuance and the bill stock move in opposing directions.

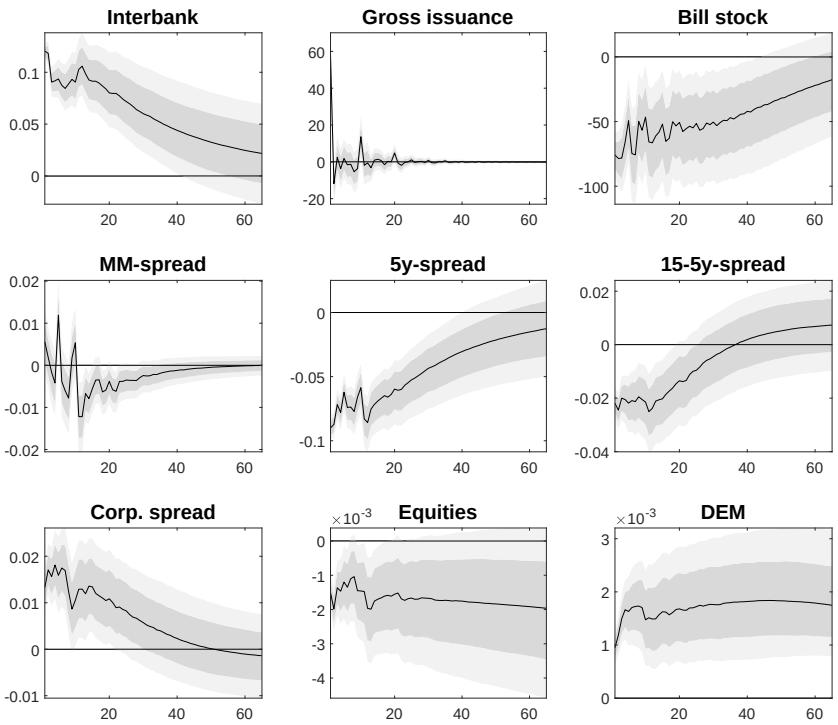

Figure 6: Impulse responses from a one standard deviation monetary policy shock. Darker shaded areas correspond to 68 per cent confidence intervals; lighter shaded areas correspond to 90 per cent.

B Calibration sensitivity of duration risk and local supply effects

The exercise in section 3 reported results for standard assumptions about the shape of duration risk exposure (γ) and the degree of local substitutability (θ), which are typically set to 0.2 and 0.5 respectively. This annex reports the sensitivity of results to alternative calibrations of those parameters in constructing the duration risk and local supply shocks.

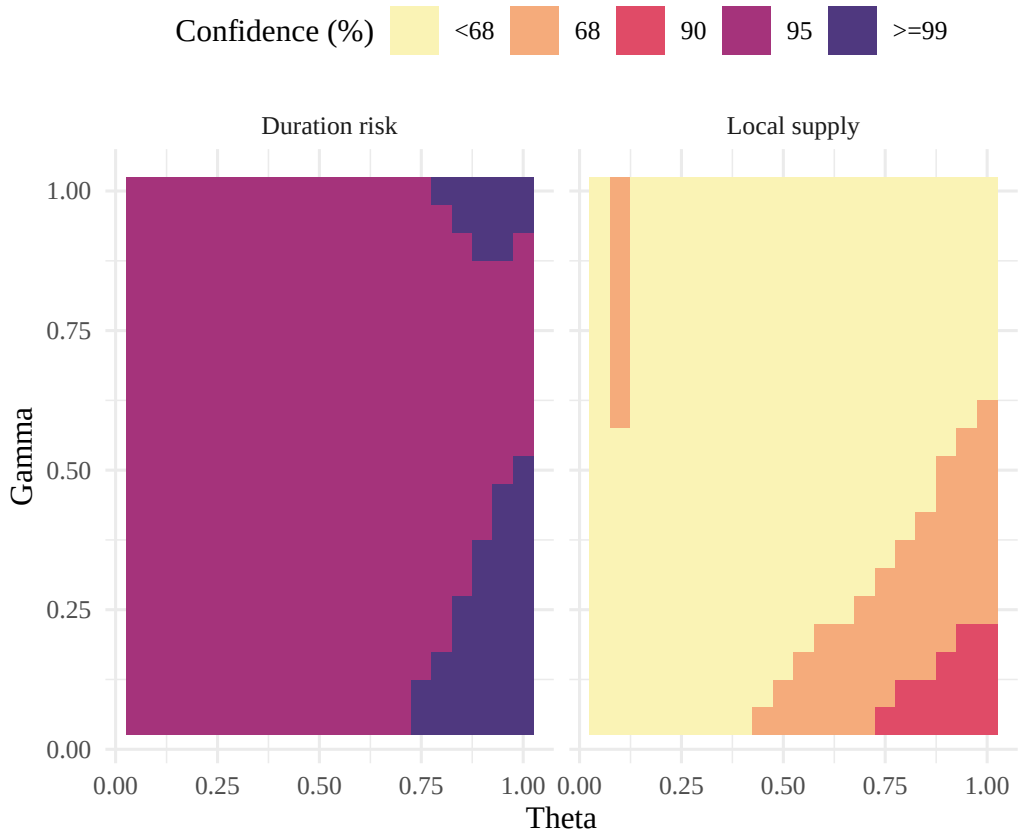

Figure 7: Significance of duration risk and local supply shocks under different calibrations of θ and γ.

Figure 7 illustrates the results of estimating eq. (7) when varying θ and γ in 0.05 increments, shaded to show the significance of duration risk and local supply shock parameters under each calibration. As reported in section 3, duration risk shocks are significant at 95 per cent confidence levels or higher. In contrast, local supply effects are more sensitive to calibration (and, separately, also to sample period); in particular, as θ increases, the significance of local supply shocks rises (as does the significance of duration risk shocks), though doesn't rise to a 95 per cent confidence level. What this implies in practice is that local supply shocks are more significant the more loosely local is defined — a θ of 1 corresponds to a local habitat of 100 per cent around the maturity of a gilt, as opposed to a narrower 50 per cent in the baseline (and in Cahill et al. (2013) and Joyce and Lengyel (2024). That result is not especially robust, but is consistent with relatively loosely defined preferred habitats, in line with the observation that regulatory requirements in this period may have been looser than more recently. Lastly, extending the window over which changes in yields are observed doesn't substantively alter the results: duration risk shocks remain significant (albeit at 90 per cent confidence), while local supply shocks remain insignificant — including at higher values of θ.