

Fiscal Dominance and the Long-Term Interest Rate

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FISCAL DOMINANCE AND THE LONG-TERM INTEREST RATE

Philip Turner*

Abstract

Very high government debt/GDP ratios will increase uncertainty about inflation and the future path of real interest rates. This will reduce substitutability across the yield curve. In such circumstances, changes in the short-term/long-term mix of government debt held by the public will become more effective in achieving macroeconomic objectives. In circumstances of imperfect substitutability, central bank purchases or sales of government bonds have been seen historically as a key tool of monetary policy.

Since the mid-1990s, however, responsibility for government debt management has been assigned to other bodies. The mandates of the government debt manager could have the unintended consequence of making their actions endogenous to macroeconomic policies. There is evidence that decisions on the maturity of debt have in the past been linked to both fiscal and monetary policy. Recent Quantitative Easing (QE) by the central bank must be analysed from the perspective of the consolidated balance sheet of government and central bank.

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Introduction

In the post-crisis debate, much has been made of the macroeconomic or financial system effects of central bank decisions on their policy rate. Yet a more fundamental challenge may well be the greater importance for central bank policies of the interest rate on long-term government bonds. This raises questions both about the virtually exclusive focus on a very short-term rate as a policy objective and about the use of short-term paper as the vehicle of market operations.

One reason for renewed interest in long-term debt markets is that governments will need to finance very large debts for many years. This will bring to centre stage the macroeconomic and financial consequences of government debt management policies. As Goodhart (2010) argues, these policies will no longer be regarded as the exclusive domain of debt managers constrained by technical benchmarks largely unrelated to macroeconomic or financial circumstances. The problem for central banks is that there is no simple way to draw the line between central bank purchases of long-term government bonds in the guise of balance-sheet-augmented monetary policy and government debt management policies. Governments could achieve the exact equivalent of central bank purchases by issuing short-term bills and retiring long-term bonds.

Several major central banks over the past few years have demonstrated their ability to lower long-term rates. Faced with near-zero policy rates, and an impaired transmission mechanism, they could no longer concentrate policy action only on guiding the overnight rate.¹ Several central banks have bought government bonds with the explicit aim of – among other objectives – bringing down long-term interest rates.² Central bank operations in long-

¹ Many of these balance sheet operations were limited to short-term interbank markets, and were designed to counter money market dysfunctions. Credit-easing measures initiated by the Bank of Japan in the early 2000s, reinforced more recently, aim to act as a supply-side catalyst. Shirakawa (2010) provides an authoritative analysis of such policies. This paper considers only those policies that sought to lower the long-term interest rate on government bonds. It does not address the question of the different impact of sales of bonds to banks compared with sales to non-banks.

² The main exception to this has been the European Central Bank which does not have a single government in front of it. Pisani-Ferry and Posen (2010) argue that this institutional fact will create increased transatlantic monetary policy divergence. The absence of a central fiscal authority and the very different budgetary

term markets are not new. The central bank's influence on long-term rates (usually the yield on government bonds) was a prominent element in earlier debates about what central banks should do and how monetary policy works. For Keynes, Meade, Tobin and many others, the long-term rate was much more important for macroeconomic developments than the Treasury bill rate.³

The risk-free yield curve also has fundamental implications for financial stability. It defines the terms of maturity transformation in an economy. Partly because of regulation, the "safe" assets that banks and institutional investors hold on their balance sheets are largely government bonds. The yield on government bonds will influence other risk exposures taken by the financial industry. And it is long-term rates – not short-term rates – that help determine the prices of long-term assets.

In short, the high level of government debt in major countries will have implications for monetary policy, debt management policy and financial stability policies. The links between these policies are many and complex. Because of huge government debt, such links are likely to take forms that will be much harder to manage.

There is of course no well-defined anchor for any policy attempt to influence the long-term interest rate. In principle, the "normal" level of long-term interest rates is determined by fundamental saving and investment propensities. In practice, however, we lack a reliable benchmark. Klovland (2004) suggests that the answer for Norway is a real long-term interest rate of a little over 4%. Hicks (1958) found that over 200 years the yield on consols tended to settle in the 3–3½ range. But we do not know how the rise of rapidly-growing and high-saving countries has altered this equilibrium. Until the early 2000s, the real long-term interest rate – as measured by index-linked securities – remained close to these historical norms (see the green line in Graph 1). But from 2003 it began to fall, and Federal Reserve increases in the policy rate from 2004 to 2006 did not stop this. Real yields for 10-year bonds during 2010 were around 1%. Recent movements in the implicit 5-year 5-years forward rate, however,

positions of the members of the euro area limits how far the ECB can purchase government bonds even in the secondary market. Its asset purchase programmes (covered bonds in 2009 and sovereign bonds in 2010) were limited in size and sterilised so as to have no impact on the money supply. In addition, many members regard the central bank purchase of government bonds as inherently compromising the independence of monetary policy: the ECB acts as a guarantor against fiscal dominance.

³ The general point is that central banks can operate in many markets other than that for short-term bills – the foreign exchange market, the government bond market, the equity markets, derivatives markets etc. Hence monetary impulses can in principle take many forms. The choice of impulse will depend on circumstances, and the policy challenge will be to assess and contain unintended consequences of new or "unorthodox" interventions. Meltzer (1995) discussed this in the *Journal of Economic Perspectives* symposium 15 years ago.

suggest a sharp rise in long-term expectations of the real long-term rate: see Graph 2. This rose from around 1½% in mid-2010 to over 2½% by February 2011.

The plan of the paper is as follows. Section 1 argues that very high government debt/GDP ratios will increase uncertainty about the future path of interest rates. This will reduce the degree of asset substitutability between short-dated and long-dated paper, impairing the effectiveness of changes to the policy rate and making the short-term/long-term mix of government debt sales a more effective instrument of macroeconomic policy (Section 2). But the long-term interest rate on government bonds also has fundamental implications for financial stability (Section 3). Section 4 reviews the macroeconomics of debt maturity choices. There is no simple logical demarcation between government debt management policies and monetary policy. A simple and exclusive central bank focus on the overnight rate, with operations only in short-term markets, conveniently created in recent years a practical separability of operational responsibilities. The historical review in Section 5 shows that central bank purchases or sales of government bonds (or the equivalent debt management operations) have often been seen as important tools to influence long-term interest rates. This has been true in many different circumstances: Keynes argued in favour of large-scale purchases to counter depression in the 1930s; the Radcliffe Report in the late 1950s argued that central banks could make a policy of monetary restriction effective more quickly by selling government bonds; and the monetary-aggregate-centred policies in the late 1970s required substantial sales of long-term government debt. In any event, there are strong empirical links between debt issuance policy and both monetary policy and fiscal policy. Section 6 argues that the mandates of government debt managers usually mean that their actions may be endogenous to macroeconomic and monetary developments – and this may have unintended consequences. Section 7 examines recent Quantitative Easing (QE) from the perspective of the consolidated balance sheet of government and central bank. The current direction of US Treasury issuance runs counter to the policy intention of QE – as it did in the similar Operation Twist operation in the 1960s.

1. New fiscal dominance?

The direct fiscal effects of changes in budget deficits (ie flow effects on income) have a quick but temporary impact on aggregate demand – at least according to the standard income-expenditure models. But the financial and monetary effects of the increased stock of government debt that results from these deficits are permanent. Public debt affects both the size and the composition of private sector balance sheets. Expectations of how such effects

will work can bring forward the ultimate impact. And volatile expectations about these effects can themselves be a source of instability.

Very persistent budget deficits in the advanced economies have led to a substantial increase in long-term government debt. According to BIS estimates of global aggregates, government bonds outstanding amounted to over \$40 trillion at June 2010, compared with \$14.4 trillion in 2000 (Table 1). Increased government borrowing in 2008 (see changes in government debt securities outstanding in Table 2) was mainly financed by the issuance of short-term debt. But this pattern did not recur in 2009 – and in 2010 short-term debt outstanding actually contracted.

There is huge uncertainty about future budget deficits and their financing. Economists disagree about how quickly deficits should be reduced: some would stress deflation risks and others inflation risks. Even if economists were to agree, there would still be great uncertainty about political choices on macroeconomic policy. It is nevertheless certain that government debt/GDP ratios in major countries will continue to rise over the next few years. Even the optimistic G20 pronouncements do not envisage debt/GDP ratios in the advanced countries stabilising before 2016. Graph 3 shows projections for the United Kingdom: according to estimates prepared before the recent election, the debt will rise to about 100% of GDP by 2013. This is well below the post-WW II peak but still represents a major shift. And the future fiscal costs of interest payments are likely to be large.

(i) *Perspectives from economic theory*

Long-term interest rates in a closed economy depend on market expectations of future debt/GDP ratios and of future monetary policy – and not directly on current policy settings.⁴ In addition, the underlying causes of fiscal deficits matter. Fiscal deficits arising from allowing the automatic stabilisers to work should not raise long-term interest rates (but might moderate an incipient fall). The policy choice of temporarily increasing structural budget deficits for a specific period as a deliberate response to weak private investment demand need not be associated with higher long-term rates.

Economic analysis takes several distinct perspectives on the implications of large government debt for inflation and for the real interest rate. One dimension is the Ricardian

⁴ In practice, international factors will influence the long-term interest rate. A small country whose credit standing is not in question will be able to borrow abroad at the risk-free international rate. In such circumstances, the relevant variable is not its own debt ratio but some measure of the global fiscal position.

versus the non-Ricardian views of the private sector response. Another is the nature of the policy responses (eg fiscal versus monetary dominance) and the interaction between them.

(a) *A Ricardian view*

In a simple world of full Ricardian Equivalence, households increase their savings by the present value of future taxes needed to repay government debt. Their desired bond holdings thus rise by the exact increase in government debt issuance. Private consumption declines to offset the increase in public expenditure, leaving GDP unchanged. The long-term interest rate therefore remains constant.⁵ In this stylised view, changes of the government debt/GDP ratio should not affect the future path of interest rates, nominal or real, in any way at all.

A related perspective is that higher government debt/GDP ratios would tend to increase the real long-term interest rate. This might have the quasi-Ricardian effect of increasing private saving and lowering private capital formation. The stronger are such effects (ie the more Ricardian the economy), the smaller the equilibrium rise in the real long-term interest rate.

(b) *Fiscal dominance*

The potential impact of debt on inflation depends on the response of monetary policy. High government debt could well constrain the ability of the central banks to set the policy rate to control inflation. This is the “fiscal dominance” view. Heavily debted governments force the central bank to accept inflation in order to reduce the real value of their debt. Historically, inflation has helped governments to reduce their public debt burdens. In the case of the United Kingdom, the unexpectedly sharp rise in inflation in the late 1960s and early 1970s reduced debt/GDP ratios significantly.

Most of the crises in developing countries in earlier decades support the fiscal dominance story. This was mainly because governments in such countries did not have the option of financing budget deficits with long-term bonds issued in local currencies and sold to the non-bank domestic private sector. They could not borrow long term because their macroeconomic policy frameworks lacked credibility. They had little option but to borrow from the banking system or from abroad. These borrowing constraints made the monetary accommodation of significant fiscal deficits almost inevitable. The interaction of domestic bank credit expansion with devaluation spirals served to reinforce fiscal dominance.⁶

⁵ See Woodford (2000). He argues that a Ricardian government – which he defines as one that reduces its deficit in response to a rise in the debt/GDP ratio – can limit the impact on long-term rates of large government debt.

⁶ One classic reference is Rodriguez (1978). BIS (2003) shows how fiscal dominance was reduced in many EMEs by major reforms. See also Buiter (2010) for an application to the recent euro area crisis.

In advanced economies, however, governments have many ways to finance large deficits in non-monetary ways. Issuing marketable government debt of various maturities to the private sector is the textbook financing choice. Hence any fiscal dominance story is more complex than in developing countries. Any analysis of how far very high government debt will constrain monetary policy choices will therefore have to address the debt financing choices of government and their consequences.

(c) *Monetary dominance*

The other extreme is “monetary dominance”. Central banks raise interest rates to avoid the inflationary effects of excessive budget deficits. Real interest rates rise across the maturity spectrum and the prospect of higher-and-higher debt service costs then forces governments to reduce their primary deficits. This seems to fit the UK story in the late 1980s and early 1990s when tighter macroeconomic policies (monetary and fiscal) brought down inflation. But it took many years for this policy stance to earn credibility and reduce long-term interest rates (see panel C of Graph 3). The adoption of a tighter monetary policy regime was supported by a strong commitment to lower budget deficits. Even so, it was not fully credible for some time. Nominal long-term interest rates on government debt therefore remained high for many years.⁷

Woodford (2000) has shown that the problem is more complex than fiscal versus monetary dominance. Faithful adherence to an anti-inflation monetary rule may not by itself be sufficient to ensure price stability – because government policy frameworks may engender fiscal expectations that are inconsistent with stable prices.⁸

The conclusion from this brief summary of these perspectives from economic theory is that there is no agreed view about the impact of government debt on the long-term interest rates. Future macroeconomic policy choices in a difficult fiscal context will influence interest rates in ways that are hard to predict. Markets do not know whether fiscal or monetary dominance will prevail in the future. If there is fiscal dominance, near-term interest rates would be kept lower than under monetary dominance. But higher expected inflation would drive up nominal interest rates further out. How far inflation would rise before being brought under control would not be known. Interest rates will rise by more than expected inflation: as the variance

⁷ King (1995) called this mechanism “some unpleasant fiscal arithmetic”. Monetary policy restraint for a time actually increases government borrowing costs: a successful policy of disinflation does not reduce nominal long-term rates immediately because expected inflation declines much more slowly than actual inflation.

⁸ His conclusion is worth quoting: “... even when both fiscal and monetary policy are *consistent* with ... an equilibrium with stable prices (as one possible outcome) ... expectations [may] ... coordinate upon an equilibrium ... in which the price level is determined by expectations regarding the government budget ... [even given a] commitment by the central bank to a Taylor rule.”

of expected future inflation increases, the inflation risk premium will rise also. If there is monetary dominance, on the other hand, near-term interest rates would be higher, in both real and nominal terms. Interest rates further out should be lower if inflation risks are contained – but this is not guaranteed because it depends on fiscal policy. There is, in short, huge uncertainty about the impact of high government debt on future interest rates.

(ii) Destabilising market dynamics?

How and when such theoretical uncertainty will translate into actual market movements will depend on market dynamics. Because of extreme monetary ease, short-term interest rates have been close to zero for some time and markets expect policy rates to remain low. The yield curve is quite steep yet long-term interest rates are very low by historical standards. Graph 4 shows that the US dollar term spread has been around 250–350 basis points since mid-2009. The pricing of interest rate derivatives products suggest a high carry-to-risk ratio for those with long positions (the lower panel of Graph 4). This interest rate configuration has major consequences for financial intermediaries. It encourages banks and others to take leveraged positions in government bonds. In the short run, this activity drives down yields. At the same time, those who have invested in government bonds face interest rate risks that increase the longer lower yields continue.

This interest rate configuration also has implications for households deciding on the maturity of their mortgage financing. When short-term rates are low and deemed unlikely to rise, households shorten the maturity of their borrowing, often counting on being able to switch to long-term mortgages when they feel interest rates may rise. As households switch, banks dependent on short-term funding have to hedge their new interest rate exposures.

The larger interest rate exposures become, and the more dependent they are on leverage, the higher the probability of destabilising dynamics once expectations change. Households rushing to lengthen the maturity of their mortgages will set off price movements in interest rate markets. Wholesale investors in bond markets such as banks, pension funds, hedge funds and so on can act quickly and on a large scale. When expectations about yields change, their efforts to cut interest rate exposures can magnify the movement of market yields. Lower bond prices can in turn trigger yet further sales. The increased volatility of prices (historic or implied from options prices) itself raises the measure of market risk used by banks. Such mutually reinforcing feedbacks can, for a time, destabilise markets even in the absence of a macroeconomic shock. The sharp decline in Japanese government bonds in 2003 illustrates just how suddenly such risks can materialise (Box 1).

Box 1

The 2003 crisis in Japanese government bonds

The market dynamics behind the sharp jump in yields on JGBs in mid-2003 provides an interesting illustration. From late-2002 to mid-2003, regular investments by banks and institutional investors in JGBs led to a steady decline in yields, with the 10-year interest rate reaching about ½% in June (see Graph 5). Regulatory requirements forcing banks to reduce their holdings of equities and weak lending demand also reinforced banks' demand for JGBs.

According to Nakayama et al (2004), the BoJ's QE commitment in March 2001 to keep policy rates very low until the CPI had registered a year-on-year rise in the CPI led market participants to expect low rates to be maintained for an extended period. The yield curve therefore flattened and bond market volatility declined. With risk tolerance levels given (and the risk measured by volatility observed in the recent past), lower volatility allowed banks to increase their holdings of JGBs. Thus the decline in market volatility reinforced downward pressures on the yield.

The long-term rate overshot in a downward direction. Once concerns about deflation risks abated, expected future short-term rates rose. As markets began to expect an earlier end to monetary policy easing, volatility rose. This rise in the volatility of interest rates served to further reduce the demand for bonds and thus magnify the rise in the interest rate. Because the banks were all using the same historical volatilities to assess risks, they were all led to try to reduce their interest rate exposures at the same time. The net result was a sharp rise in yields which imposed significant losses on the banks.

At present, market expectations about interest rates seem well anchored. But two qualifications argue against complacency. First, current market expectations of future fiscal policies are probably still conditioned by the credibility governments in most advanced countries earned from successful fiscal consolidation during the 1980s and the 1990s. Those policies took many years to convince markets and bring down long-term interest rates. Second, the two temporary spikes in implied interest rate volatility – during the post-Lehman period and around the Greek crisis (shown in Graph 4) – suggest a need for caution.

2. Imperfect asset substitutability across maturities

The previous section suggested that a long period of high government debt/GDP ratios may increase uncertainty about the future path of interest rates, both real and nominal. Doubts about how governments will respond probably increase uncertainty about inflation and, perhaps, about future growth. Macroeconomic tail risks seem to have risen. At least much market commentary suggests so – some talk about latent inflation risks while others fret about deflation. The credibility of fiscal and monetary policy frameworks in the advanced countries has been weakened by the crisis. And governments' ability to implement effective countercyclical policies is more constrained when debt is high.

Uncertainty about future interest rates is important because it determines whether investors regard short-term and long-term paper as close substitutes. In a world of perfect certainty

about future short-term rates, the maturity mix of debt would have no consequences because debt of different terms would be perfect substitutes for one another. A high degree of asset substitutability would also support the pre-crisis monetary policy orthodoxy that control of the overnight interest rate is sufficient for central banks to shape macroeconomic developments. Changes in the overnight rate (and expected future overnight rates) feed through quickly to at least the near end of the yield curve. Transmission of policy rate changes to the whole structure of interest rates is thus effective.

But uncertainty about the path of future interest rates (and differences in investor preferences) will make debt of different maturities imperfect substitutes. Because of this, changes in the mix of short-term and long-term bonds offered by the government will change relative prices and thus influence the shape of the yield curve. At the same time, monetary policy based on setting the policy rate becomes less effective: the lower the degree of asset substitutability, the weaker the transmission of changes in the overnight rate to other interest rates. Hence government debt management policies (or central bank purchases of bonds) become more effective exactly when classic monetary policy reliant on the overnight rate works less well.

Furthermore, debt management policies can be all the more effective in the special case of the zero lower bound (ZLB). This is because policies aimed at shortening the duration of debt held by the public (ie selling Treasury bills and buying government bonds) may lower long-term yields without raising short-term yields, which are glued close to zero at the ZLB. But note that the corollary of the ZLB argument on its own is a policy asymmetry. Central banks may need to buy government bonds when at the ZLB if they want to stimulate demand. But they have no need to sell government bonds when they want policy to be restrictive – because all they have to do is raise the policy rate.

Nevertheless, the conclusion about the effectiveness of debt management policies based on asset substitutability is much broader and more symmetric than the special ZLB case. Even in normal circumstances, when the policy rate is above zero, policy can be made to work more surely and more rapidly by acting in longer-dated markets. It therefore applies to policies of monetary restriction as much as to policies of monetary ease. This may become very relevant if inflation rises in the years ahead.

It was perhaps relevant a few years back. The fall in bond yields in the early phase of Federal Reserve tightening in 2004–05 (the famous “conundrum” of Greenspan⁹), which weakened the restrictive impact of higher policy rates, could have been countered by longer maturity debt issuance or by Federal Reserve sales of long-term bonds. How effective this would have been depends on the degree of asset substitutability.¹⁰

It could be argued that the prevailing sense of interest rate predictability at the time of the “conundrum” combined with a banking system willing to take huge duration exposures would have made a policy of bond sales ineffective. But it should be remembered that this sense of interest rate predictability was itself deliberately nurtured by the Federal Reserve policy of a “measured pace” in increasing the Federal funds rate. The Federal Reserve was anxious to avoid a bond market collapse similar to the one that took place around the early 1994 tightening. This predictability itself probably made banks and others increase their leverage – including in interest rate markets – and so may have contributed to the crisis (BIS, 2010). This remains an open empirical question. As it was, the 2002–5 period was one when the maturity of US Federal debt shortened significantly. The average maturity of new issuance was less than 40 months for most of this period: see Graph 6. This issuance pattern also contributed to holding down long-term rates.

Analysis of all this is very difficult. There is no reason to expect the degree of substitutability between assets of different maturities to be constant over time.¹¹ In addition to the uncertainty about future interest rates created by large government debt, the ability of financial intermediaries to take duration exposures will also be an important determinant.¹² Both determinants are likely to change over the cycle. In a crisis, in particular, asset substitutability will fall not only because uncertainty about future interest rates rises but also

⁹ See chapter 20 of Greenspan (2007) for an account of this. He says that low long-term interest rates reflected real economy saving and investment propensities globally. He does not address the question whether Federal Reserve sales of government bonds could have driven long-term yields higher.

¹⁰ Hamilton and Wu (2010) consider a converse operation. They estimate that if the Federal Reserve had, in December 2006, sold all its holdings of short-term Treasury bills (\$400 billion at that time) and used the proceeds to buy long-term bonds, this might have resulted in a 14 basis point drop in the 10-year yield and an 11 basis point increase in the six month rate.

¹¹ Agell and Persson (1992) argue that asset substitutabilities and the associated risk premia reflect the subjective risk perceptions of investors and so will not be stable over time. Historical return-covariance matrices to measure the degree of asset substitutability miss “news” affecting market fundamentals. Their empirical work supports these concerns: they are therefore very sceptical about the scope for debt management policy to affect yields in a predictable way.

¹² Other important determinants are: initial conditions (eg closeness of the long-term rate to its perceived lower bound); the mandates given asset managers (eg value preservation versus fixing future income streams); accounting rules; and the regulation of financial firms. Changes in yields will also influence income flows to bond holders and lead to capital gains or losses. How banks, pension funds and other investors respond to such income effects will also be important – and very difficult to foresee. None of these elements is well understood.

because banks and others will be less able to undertake interest rate arbitrage operations. Indeed, impaired bank arbitrage capacity was one important justification for the exceptional balance sheet policies central banks followed in this crisis.

Policymakers will not find it easy in real time to identify these elements correctly and to quantify the impact on underlying asset substitutability. What often becomes clear in retrospect (eg incipient rises in bond market volatility related to worries about fiscal deficits, leveraged positions in interest rate markets holding down long-term yields etc) will not be so obvious at the time.

Nor is there any reason to suppose that the degree of asset substitutability will be constant across countries. In particular, it is likely to be lower in smaller or less developed financial markets. Hence the central bank in such countries is more likely to intervene directly in several market segments.¹³

One final word of caution. It is true that imperfect asset substitutability does give the government or the central bank an additional policy tool. But there is a qualification: Goodhart's Law will eventually apply to debt operations.¹⁴ The central bank may virtually fix the yield of its target bond. But if central bank action is known to have concentrated on a particular maturity, then its information content is compromised. Investors may judge that such paper is overpriced relative to paper of other maturities, and therefore avoid buying it. In time, private sector contracts might avoid referencing an interest rate regarded as manipulated by the authorities.

3. The long-term interest rate, maturity transformation and financial stability

The long-term interest rate is of key significance also for financial stability because it defines the shape of the yield curve and is fundamental for the pricing of all long-term assets. The short-term interest rate, on the other hand, is probably not a direct element in financial

¹³ On this see Filardo and Genberg (2010) and chapter H of BIS (2009). Actions to stabilise government debt markets (eg sharp shortening of duration of new debt issuance, facilities to allow bond holders to swap long-term fixed interest rates with short-term variable rates, relaxation of mark-to-market accounting rules) were prominent in several EMEs during the 2008 crisis.

¹⁴ Goodhart's Law is "Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes".

stability. In many circumstances, however, the policy could affect other financial variables and thus influence risk-taking.¹⁵

(i) The risk free yield curve and maturity transformation

There are at least three reasons why the shape of the risk-free yield curve (almost always that based on government paper) plays a key role in determining the risk exposures taken by the financial industry.

- The steepness of the yield curve determines current returns (ie ignoring capital gains and losses) from borrowing short and lending long. It also affects the incentives of banks to lengthen the duration of their liabilities.
- The level of long-term rates influences asset prices by providing the discount rate to value the expected earnings of long-lived assets. Other things equal, a reduction in the long-term rate would tend to raise house prices, equity prices and so on.¹⁶ Hence the level of long-term rates is central to any analysis of asset prices.
- The long-term rate provides the risk-free benchmark for financial firms such as pension funds to fund future long-term liabilities. When long-term rates fall, steady-state pensions decline.¹⁷ Funds that cannot cut the pensions they pay may build-up hidden losses. Or they may seek to preserve their earlier rates of return by investing in higher-risk assets. Either way risk exposures could rise.

The macroeconomic configuration at the present time is conducive to sizeable interest rate exposures in the financial industry. Because virtually all firms are tempted to take the same risks (“herding”), there is also a very important systemic dimension. All firms will not be able to get out when expectations of future rates change – leading to “overshooting” in market interest rates or even illiquidity in interest rate hedging markets.¹⁸

But how should we analyse these risks? The problem is that there is no widely agreed way of analysing the optimal degree of maturity transformation in an economy. Savers want their part of their assets to be liquid but real productive investment is longer-term and illiquid. This gap can be bridged by maturity transformation offered by banks, by other financial firms, by

¹⁵ Mishkin (2011) provides a good review. There is no evidence that lower policy rates led to increased risk-taking in the financial industry during the decade before the financial crisis. Indeed, credit spreads were lowest, and market volatility measures unduly depressed, after the Federal Reserve had raised the Federal funds rate to 5½%. See Graph 2, page 22 in BIS (2010).

¹⁶ At least in the short-run. In general equilibrium, factors such as Tobin's q, the rental/price ratio and so on would play an equilibrating role as asset prices diverge from their steady-state values.

¹⁷ They will benefit from a one-time rise in the market value of their financial assets – but normally the present discounted value of their liabilities (which typically have a longer duration) would rise more.

¹⁸ Another important financial stability dimension not considered in this paper is the ability of banks and other financial firms to issue long-term paper when government long-term borrowing is large. Financial institutions globally drastically cut long-term bond issuance in 2010 – see Table 2. This is discussed in Turner (2011).

markets or by government. Economic theory does not seem to provide clear guidance about who is best placed to undertake maturity transformation.¹⁹

(ii) Official accommodation of private liquidity preference?

Keynes's liquidity preference theory touched on the maturity transformation issue. He argued that the private sector's willingness to assume liquidity and maturity risks is not well-anchored in fundamentals. Instead it is strongly influenced by subjective factors. Hence his policy prescription was that government debt issuance should "accommodate the preferences of the public for different maturities". It was, he argued, socially desirable that risk-averse investors should be offered some minimum, safe return on their capital. The real long-term rate of interest should not go to zero. Equally, it should not be too high. Keynes's view was that, in periods of extreme liquidity preference when investors shunned government bonds, governments should simply offer shorter-dated paper. Many economists have echoed in different ways the case for the official accommodation of private liquidity preference.²⁰

The analysis by Tirole (2008) of maturity transformation by financial intermediaries such as pension funds and insurance companies which have (uncertain) long-term liabilities (and assets of a shorter maturity) carries this Keynesian tradition further. In the presence of macroeconomic shocks that affect everybody simultaneously, he argues, private sector assets are not useful. Instead what is needed is an external risk-free store of value such as government bonds.²¹ A prolonged period of low rates of interest on government bonds can make some pension products offered by such firms unviable. Tirole therefore argues that:

"liquidity premia [on] risk-free assets [is] a useful guide for the issuing of government securities both [in total] and in structure (choice of maturities) ... a very low long rate signals social gains to issuing long-term Treasury securities. A case in point is the issuing by HM Treasury of long-term bonds in reaction to the low rates triggered by the 2005 reform of pension funds requirements."²²

¹⁹ Tirole (2008) explains lucidly why current economic models which assume perfect capital markets do not address the question of liquidity satisfactorily.

²⁰ Goodhart (1999) detected a "Radcliffean" flavour in Kroszner (1998): "An optimising independent debt management authority will tend to issue the debt instruments enjoying the greatest liquidity premium since these are the instruments that will require the lowest pecuniary return."

²¹ Echoing Keynes, he writes, "risk-free securities are held not so much for their return, but rather because they deliver cash when firms need it: they are liquid in the macroeconomic sense." This logic of providing risk-free assets applies to the State's own citizens holding such bonds – it may not apply when foreigners are the main holders.

²² There is an earlier precedent for such a policy. A report by HM Treasury in 1945 that is discussed below suggested that an elastic supply of 10-year bonds at 2% would allow insurance companies to offer "annuities

The question is how to translate the theoretical arguments of Keynes and Tirole into a policy that influences (but not rigidly determine) the long-term interest rate. Keynes's prescription was that the government should gear its issuance policy to defining an upward-sloping floor for the risk-free yield curve. As will be noted below, the specific proposal of Keynes in 1945 was for a tap issue of both 5-year and 10-year bonds at fixed rates.

How to do this in present-day terms? To provide the required insulation from inflation shocks, inflation-linked debt would be best. In normal circumstances, the market rate (at which the government usually borrows) would be above such a floor. An elastic supply of inflation-linked papers of different dates (eg 5-year, 10-year, consols) could be offered with (low but positive) fixed-rate coupons that rise with the paper's original maturity. (There may be a comparable argument for a ceiling on the long-term real rate).

(iii) A market-driven long-term rate?

But how far should the public sector go in defining the terms of maturity transformation?²³ It would be reassuring to imagine that underlying saving and investment propensities of the private sector define the real interest rate in normal times. Keynes threw some doubt on this classical view. In addition, the fact is that government policies nowadays dominate the terms of maturity transformation in modern economies. Very large government debt defines the yield curve. Prudential regulations have a pervasive effect: many supervisory rules for financial firms in effect create a near-captive demand of regulated entities for government paper. In some countries, near-mandatory holdings by regulated financial firms are so large as to impair the information content of so-called "market" prices. Recent regulatory proposals (eg Basel III) aimed at encouraging banks to reduce liquidity risks are tantamount, in most countries, to getting banks to hold more government debt – simply because such debt is traded in liquid markets, is of low credit risk, and (unlike credit exposures to the private sector) holds its value during cyclical downturns.²⁴ The influence of government policies is also felt in many other ways. The terms of mortgage finance are heavily conditioned by state financing arrangements. Taxation practices are another potent element shifting firms from

on joint lives, calculated on the basis of a low rate of interest" and so encourage "the habit of thrift" (HM Treasury, 1945).

²³ In earlier periods, the term structure of interest rates was regulated. In countries where interest rates on bank deposits were controlled, the regulations usually enforced (irrespective of the cyclical position of the economy) an upward sloping interest rate curve. This rewarded savers who were prepared to give up liquidity and place their funds at longer terms, which made the banks safer.

²⁴ Note, however, that the liquidity rules prevailing up until the mid-1970s generally enjoined banks to hold short-dated paper. For instance, UK banks were required to hold only short-dated government bills to meet their liquid asset ratios ... long-dated government bonds did not meet the liquid asset rules.

equity to debt finance. The already large role of government has probably become even more dominant with the financial crisis. But this role is quite unconscious. The cumulative impact of the many official policies on the long-term interest rate clearly needs much more analysis.

(iv) A constraint on monetary policy

For the purposes of this paper, it is sufficient to note that the long-term interest rate is not a variable that can be manipulated for macroeconomic objectives without taking account of the implications for financial stability. Interest rate exposures of the financial industry are a matter of concern today because the prospect of large government debt/GDP ratios has increased the uncertainty about future interest rates.

The problem for central banks is that interest rate exposures of banks and other leveraged players can constrain monetary policy choices. Substantial holdings of short-term bills could make banks less responsive to monetary control.²⁵ Holdings of long-term bonds expose them to the risk of capital losses. On this latter point, Eichengreen and Garber (1990) quote the Federal Reserve in 1945:

“A major consequence ... of ... increasing the general level of interest rates would be a fall in the market values of outstanding Government [bonds] ... which could have highly unfavourable repercussions on the functioning of financial institutions and ... might even weaken public confidence in such institutions.”

They point out that operations had to be undertaken in the immediate post-war period to reduce the interest rate exposures of banks *before* the Federal Reserve could feel comfortable raising policy rates.

Even in later years, monetary policy decisions were in practice often conditioned by concerns about the interest rate exposures of banks. As noted above, the sharp bond market decline around the 1994 Federal Reserve tightening hit very hard a number of institutions with leveraged bond portfolios. The “measured pace” of tightening during 2004–05 was designed in part to avoid a similar destabilisation of bond markets. The financial system ramifications of changes in the long-term rate have mattered more for the policy decisions of central banks than many would like.

²⁵ This applies in particular to those forms of monetary control that rely on liquid asset ratios. The UK authorities in the post-war authorities kept liquid asset ratios imposed on banks very high because of the large volume of short-term government debt held by banks. Forcing banks to remain very liquid also made them safer – and so served financial stability objectives. On the UK’s experience, see Dow (1965), Chapter IX.

4. The macroeconomics of central bank operations in government debt markets

The main emphasis of Keynes was on macroeconomic theory. Open market operations in long-term government debt were central to Keynes's analysis in his *Treatise on Money* of how central banks could combat slumps. The focus of his analysis was on the asset side of the central bank's balance sheet and thus mirrors the Federal Reserve's rationale for its recent Quantitative Easing. Unlike Hawtrey (for instance), he did not focus on the liability side – that is the impact on commercial bank deposits. Keynes argued for what he called “open market operations to the point of saturation”:

“My remedy in the event of the obstinate persistence of a slump would consist, therefore, in the purchase of securities by the central bank until the long-term market rate of interest has been brought down to the limiting point.”²⁶

He felt that central banks had “always been too nervous hitherto” about such policies, perhaps because under the “influence of crude versions of the quantity theory [of money].”²⁷ He repeated this analysis in *The General Theory*:

“The monetary authority often tends in practice to concentrate upon short-term debts and to leave the price of long-term debts to be influenced by belated and imperfect reactions from the price of short-term debts – though ... there is no reason why they need do so.”²⁸

He did not believe that there had been a liquidity trap in the 1930s: it was a theoretical possibility that had not been tested “owing to the unwillingness of most monetary authorities to deal boldly in debts of long term”.²⁹

He went on to suggest that the “most important practical improvement which can be made in technique of monetary management” would be to replace “the single Bank rate for short-term bills” by “a complex offer by the central bank to buy and sell at stated prices gilt-edged bonds

²⁶ Keynes (1930), pp 331–2. One constraint he saw was that a central bank acting alone would simply induce capital outflows: he felt the newly established BIS could encourage internationally coordinated central bank efforts to reduce long-term interest rates. Per Jacobsson, Economic Adviser at the BIS at the time, also strongly supported policies aimed at reducing long-term rates.

²⁷ As Congdon (2007) notes, Keynes maintained this emphasis in *The General Theory*: “There are dozens of statements in *The General Theory* and other works by Keynes in which he criticised an exclusive focus on the short-term rate in the money market and urged the much greater importance of the long-term rates set in the bond market”. Tily (2010) analyses this in some detail.

²⁸ Keynes (1936), pp 206.

²⁹ Basile et al (2010), pp 137. This article counters the view that the United States had fallen into a liquidity trap in the 1930s.

of all maturities”.³⁰ It is important to remember that Keynes was writing in the 1930s – when budget deficits were small and governments (obsessively!) Ricardian.

It was Tobin (1963) who developed the theoretical models of how central bank operations in long-term debt markets work. He stressed the importance of the policies of government debt finance – not the central bank – on the long-term rate of interest.

Central banks in effect issue the shortest duration official debt in their operations to implement monetary policy. From the perspective of portfolio choice, government issuance of short-term debt is like monetary expansion.³¹ Tobin (1963) puts this point well:

“There is no neat way to distinguish monetary policy from debt management, [both] the Federal Reserve and the Treasury ... are engaged in debt management in the broadest sense, and both have powers to influence the whole spectrum of debt. But monetary policy refers particularly to determination of the supply of demand debt, and debt management to determination of the amounts in the long and nonmarketable categories. In between, the quantity of short debt is determined as a residuum.”³²

He went on to argue for the use of debt management (ie shifting between short-dated and long-dated paper) as a countercyclical policy to influence private capital formation, and thus real output. His conclusion was that:

“The Federal Reserve cannot make rational decisions of monetary policy without knowing what kind of debt the Treasury intends to issue. The Treasury cannot rationally determine the maturity structure of the interest-bearing debt without knowing how much debt the Federal Reserve intends to monetise”.³³

His analysis was that of portfolio choice under uncertainty (which he had used in his famous interpretation of Keynes’s liquidity preference theory). While portfolio rebalancing effects can take many forms, one important distinction is between domestic and international rebalancing:

³⁰ Congdon (2010) also draws attention to this discussion. A case for central bank purchases of government bonds can also be made in the special case of a liquidity trap. Auerbach and Obstfeld (2005) provide a model that justifies the efficacy of such policies in a liquidity trap.

³¹ Rolph (1957) put it this way: “If short-term obligations possess stronger money characteristics than long-term public debt ... shortening the average maturity of government debt becomes an inflationary measure.”

³² King (2004) makes a similar point that central bank purchase of bonds and the government shortening the maturity of issuance are virtually the same.

³³ His suggestion was that full responsibility for Federal government debt management be assigned to the Federal Reserve, not the US Treasury. One aspect Tobin did not address might be noted: a central bank of a monetary area of several independent countries faces a special challenge because there is only one central bank but many different governments that decide debt management policy. This is clearly relevant for the euro area.

- *Rebalancing between domestic assets.* Central bank purchase of bonds force lower bond holdings on the private sector. The effect on the yield curve is greater the lower the degree of substitutability between long-dated and short-dated paper.
- *International portfolio rebalancing.* Domestic official purchases to lower long-term yields should shift portfolio demands from domestic to foreign assets. This should induce currency depreciation, which would reinforce the impact on aggregate demand coming from the domestic rebalancing channel.

Nobody disputes the logic of these portfolio rebalancing effects. The real controversy concerns magnitudes. How large would be the macroeconomic impact of central bank bond purchases in practice? In what circumstances would international rebalancing effects be stronger than domestic rebalancing effects?

(i) Domestic rebalancing and the long-term interest rate

The domestic rebalancing channel depends on the imperfect substitutability of assets of different maturity. It also depends on the willingness of banks to do interest rate arbitrage. Higher asset prices have wealth effects that can stimulate aggregate demand (Tobin, 1963). By making some financial assets more reliable for posting as collateral, higher asset prices may ease borrowing constraints.

But there has, over the years, been little consensus about the magnitude of these effects. Several empirical studies conducted before 1960 formulated this issue in terms of the question: how much must the volume of money increase in order to reduce the bond yield by one percentage point? A J Brown's answer in 1939, based on pre-war UK data, was 20%. A M Khusro's answer in 1952 was a range of between 10 and 30%. R Turvey's 1960 study based on US data found that it took a 10% increase in money to lower the bond yield by one percentage point.³⁴ Most estimates of term structure equations in the 1970s and 1980s, however, found it hard to detect any significant impact of changes in the relative supplies of short-term or long-term government bonds – perhaps because of too little variation in asset supplies.³⁵

³⁴ As reported in Dow (1965), pp 307, which contains the full references to the papers cited.

³⁵ Some very recent studies, however, do seem to find significant supply effects: see Krishnamurthy and Vissing-Jorgensen (2010). Noting that foreign official bodies are the registered holders of almost 40% of US Treasuries, Krishnamurthy and Vissing-Jorgensen (2010) also find evidence that official investors are less price sensitive than private investors. However, foreign official holders did move from short-term bills to 10-year Treasuries as short rates fell from September 2008.

Nevertheless, simulations of large-scale econometric models have suggested that such effects could be of practical significance. One of the earliest studies is that of Ben Friedman (1992). He used a combination of the MPS (MIT-Penn-SSRC) quarterly econometric model of the US and a model representing the determination of interest rates in four separate maturity submarkets for US government securities. He shows that:

“... a shift to short-term government debt lowers yields on long-term assets ... and in the short run stimulates output and spending ... the stimulus being concentrated on fixed investment.”

The transmission mechanism (in his paper) worked through the corporate bond yield: lower bond yields stimulated business investment, reduced mortgage interest rates and the dividend-price yield. He found that a \$1 billion per quarter shift from long-dated to short-dated debt would reduce the long-term government bond yield by 55 basis points. Note that this amounted to a reduction of one-fourth in the outstanding quantity of long-term Treasuries at that time – an operation that would today require many billions of purchases. This would increase real residential investment by almost 7% and investment in equipment by 2.5%: real GDP would rise by 1%. Corporate profits rise by 5%, and equity prices increase by 4%.³⁶ These results provide a quantification of Tobin’s earlier theoretical argument that shortening the duration of government debt would stimulate capital formation and growth.

Such transmission channels are also important for the policy debate because central banks need to take account of “shocks” to the long-term interest rate in their macroeconomic assessments. A higher long-term interest rate increases the cost of corporate and mortgage finance. A decline in asset prices may also reduce aggregate demand. Even increased financial market uncertainty can depress demand. Such effects can argue for smaller increases in the policy rate than would otherwise be needed. It is not surprising that changes in bond yields comes up frequently in central bank deliberations on the policy rate.³⁷

³⁶ See Table 13.1 of Friedman (1992). Note that the assumption about monetary policy in his simulation differs from recent studies of the impact of Quantitative Easing in the US and the UK: he assumes the growth rate of M1 is fixed so that the Treasury bill rate rises as short-dated paper replaces long-dated paper. The yield curve flattening is therefore larger. The Treasury bill rate rises by 67 basis points. Hence the yield curve flattens by more than a full percentage point.

³⁷ Around the time of the bond market volatility in early 1994, for example, the FOMC minutes of 22 March 1994 recorded that “Many members noted that money market interest rates would have to rise by a relatively sizable amount from current levels, given underlying economic conditions, but a majority indicated a preference for another small move at this time. Many were concerned about a possible overreaction in financial markets that had become quite sensitive and volatile since early February.”

(ii) *International rebalancing and the exchange rate*³⁸

Domestic official purchases to lower long-term yields should shift portfolio demands from domestic to foreign assets. The resultant capital flows into higher-yielding foreign assets will tend to limit the decline in local yields. This should induce currency depreciation, which would reinforce the impact on aggregate demand noted in (i) above. In a small country with a tightly managed exchange rate link to a large country, long-term yields would change little. In the case of US policies aimed at lowering US yields, Neely (2010) finds evidence that, following US quantitative easing, yields on non-US bonds also fell by 45 basis points (compared with the estimated 90 basis points for US Treasuries) and the dollar depreciated by 5%. Hence a country acting alone gets some additional stimulus from currency depreciation. But if other countries also adopt more expansionary policies – perhaps in order to limit currency appreciation – it benefits from increased exports. As with domestic rebalancing, the size of such effects depends on the degree of substitutability between domestic and foreign assets – and neither is this likely to be constant over time.

Large-scale foreign official purchases of US Treasuries also drive down long-term yields, reinforcing the impact of the Federal Reserve's QE. But the impact on the exchange rate would have the opposite sign – at least to the extent that the alternative for foreign official purchasers would be increased purchases of non-US debt securities (eg bunds or gilts). The dollar would tend to appreciate as foreigners buy US bonds. Hence the combined impact of both foreign official and Federal Reserve purchases of US Treasuries on the exchange of the dollar is of uncertain sign. Relative magnitudes may provide some guide. At end-2009, the Federal Reserve held under \$800 billion of US Treasuries; the reported direct holdings of foreign official institutions were \$2.7 trillion.

The governments of countries that share a common monetary area (eg the euro area) may take advantage of their independence in debt management policies to offset their lack of monetary policy independence. Hoogduin et al (2010) draw attention to a coordination problem that is specific to the euro area. They find evidence that a steep yield curve prompts debt managers in individual countries to shorten the maturity of their debts. A government in a small country might not see this as increasing its own refinancing risks. But if several countries act in this way it does increase refinancing requirements for the euro area as a whole. This will serve to increase the speed of transmission of shocks in one country

³⁸ This section does not address the wider issue of the impact of fiscal deficits on the real exchange rate. In the short run a fiscal deficit may lead to real appreciation but a rise in the debt-dependent risk premium suggests real depreciation in the long run. See Kugler (1998).

(Greece recently) to other countries seen as sharing similar exposures. They conclude on “the need for coordination ... to limit the use of short-term debt”. This was not covered in the Maastricht Treaty: indeed, some countries shortened the duration of their debt in order to reduce interest payments and thus the reported budget deficit (Piga, 2001).

5. History of central bank operations in government debt markets

The active use of central bank balance sheet policies after the 2007 financial crisis has given new life to Keynes’s theories of central bank operations in debt markets. The following paragraphs summarise the influence of these ideas on some major policy debates in the United Kingdom and the United States.

(i) United Kingdom: National Debt Enquiry, Radcliffe Report and beyond

How did Keynes’s ideas affect policy in the 1930s and beyond? Geoff Tily (2010) argues that the central focus of Keynes’s economics was the management of money at a low long-term rate of interest. This – rather than countercyclical fiscal policy – held the key to prosperity and stability. Tily goes on to argue, however, that Keynes’s monetary economics were much more influential before 1950 than they became in later decades.

It is true that there was a massive conversion of government debt to a lower coupon in 1932, which Keynes hailed as a “great achievement” for the Treasury and the Bank of England. Short-term rates were cut sharply. But his more general advice for aggressive central bank purchases of debt (or the equivalent change in issuance) went unheeded. Government debt remained long term: in the mid-1930s, only 3% of bonds had a maturity of less than five years and 86% of bonds had a maturity in excess of 15 years.³⁹ Nevertheless, thanks largely to debt conversion, long-term rates during the 1930s declined from 4½% to below 3%.

During World War II, low interest rates became a key ingredient of wartime finance. In the closing months of World War II, with the UK facing huge government debts, Keynes, an influential member (with Meade and Robbins) in the UK Treasury’s National Debt Enquiry (NDE), argued against the “dogma” of financing debt at long maturities. Governments should not “fetter themselves ... to a counter-liquidity preference” but should accommodate the preferences of the public for different maturities. He recommended that:

³⁹ Quoted from the Radcliffe Report by Capie (2010), pp 304. Other figures cited below are also from Capie.

“Interest rates [at] different maturities should ... pay attention primarily to (a) social considerations in a wide sense; (b) the effects of Government policy on the market for borrowing by the private sector and the problem of controlling the desired rate of investment; and (c) to the burden of interest charges on the Exchequer.”⁴⁰

It was the Permanent Secretary to Treasury who drafted the memo, dated 15 May 1945, that summarised the Enquiry’s conclusions. He made a point of noting that it took as given Keynes’s view that the long-term rate of interest could be controlled by determined official action. The proposed “programme of initial procedure” as he put it – the idea was to adapt this policy in the light of experience – was: “the Treasury bill rate to be brought down to ½% and 5-year bonds to be issued at 1½% and 10-year bonds at 2% to be issued on tap, a new series to be started annually”.⁴¹

In the event, the upshot of the NDE was that the policy of “cheap money”, which began in the 1930s depression, would be reinforced in the post-war period. Money market rates were reduced to ½% and a target of 2½% was set for the long-term rate. The reservations of the Bank of England were discretely muffled.⁴² Meade dismissed the argument that this monetary policy would lead to excessive liquidity:

“... I tried hard to persuade Lucius Thomson-McCausland of the Bank of England that the correct criterion for an expansionist or restrictionist monetary policy was whether the total national expenditure was showing signs of declining or rising too rapidly. Beneath a general stability of the total national expenditure one could let private enterprise go ahead on its own ... even though particular firms ... would from time to time burn their fingers. But Lucius persists in thinking in terms of pools of what he calls ‘flabby’ money which rushes from commodity to commodity causing speculative booms and slumps, undermining confidence and thus leading to a general slump. He wishes to drain away such stagnant pools, keeping money what he calls

⁴⁰ Keynes (1945), pp 396–7. The chapter on the theory of liquidity preference and debt management policy in Tily (2010) is illuminating on this issue. James Meade’s diary provides an entertaining account of Keynes’s dealings with Permanent Secretaries during the meetings of the National Debt Enquiry: “perverse, brilliant and wayward” Keynes, “who on the rate of interest was revolutionary in thought but very cautious in policy”.

⁴¹ The memo, which was “for the Chancellor’s eye only” (Treasury file T230/95), is reproduced in Appendix 3.1 of Tily (2010). The very first paragraph of this Treasury memo revealed the jurisdictional sensitivities vis-à-vis the Bank of England “who must manage the gilt-edged market”: “there must be the greatest possible community of view between [the Treasury and the Bank of England] ... none of our suggestions ... should be determined without careful prior consultation.”

⁴² See Fforde (1992) pp 335–337. Niemeyer’s criticism of the Report of the National Debt Enquiry in 1945 was that “... [it] has not looked at all at the actual structure and market standing of existing medium and long-term debt ... the argument that continuous borrowing gives the borrower command of the market can only be true if the borrower is able and willing to inflate.”

‘taut’. But the danger is, of course, that the general process of keeping money ‘taut’ will maintain the rate of interest at an unduly high level so that there is a more or less permanent deficiency of total national expenditure.”⁴³

It is striking how well all this conversation over lunch in May 1945 foreshadows later discussions about monetary policy and speculative bubbles.

According to Meade (1990), Keynes argued in the committee that it was “socially desirable” that rentiers should get some return on their capital – and so the long-term interest rate should not go to zero.⁴⁴ This was the criterion for government debt management he listed first in his NDE memorandum cited above. This may foreshadow recent discussions about the link between systemic stability and the long-term rate of interest. Note that limiting government debt servicing charges was the criterion Keynes put last.

In the years that followed the immediate post-war period, the policy objective became one of holding long-term interest rates down even as growth and investment strengthened. This shift in emphasis impeded effective monetary control. By 1952, the percentage of bonds with a maturity of 15 years or more had fallen to 63%. During the 1950s, this proportion was to fall further, prompting the Radcliffe Report to describe the huge supply of short-dated bonds as “a constant source of embarrassment to the authorities”. The aim of maintaining stability in the bond market – not macroeconomic control – had become paramount for the central bank. HM Treasury, in its evidence to Radcliffe, was quite clear:

“No attempt is made to use official purchases and sales in the market for the specific purpose of raising or lowering the level of medium and long-term interest rates. The suggestion has been made that sales of longer-dated securities would be increased if they were offered at prices below the market. In theory, this might be possible for a time. In practice, such operations would create market uncertainty and so impair the prospects of continuing official sales of securities ... Such operations would involve a serious risk of damage to confidence and to the Government’s credit.”⁴⁵

Many of the economists who gave evidence to Radcliffe disagreed with this view. Several argued that a main effect of monetary policy on aggregate demand worked through the

⁴³ Meade (1990), pp 74.

⁴⁴ Meade, who believed that investment was more interest rate sensitive than Keynes did, disagreed. His view was that the long-term rate of interest could be reduced to near zero to counter depression but should rise to meet any inflationary threat. His diary entry for 26 February 1945 reads: “in my mind the real social revolution is to be brought about by the most radical reduction in interest rates which is necessary to prevent general deflation”. See Meade (1990), pp 46.

⁴⁵ Radcliffe (1960) *Memoranda of Evidence*, pp 107–8.

long-term interest rate. Kahn (1960) reiterated the view that both Keynes and Meade had expressed in the NDE, namely that the:

“authorities ... including the Bank of England ... and those responsible for managing the national debt ... are capable, within very broad limits, of achieving any desired structure of interest rates ... provided they are not worried about the quantity of money.”⁴⁶

Paish provided very interesting graphical evidence that between 1919 and 1958 there was a clear inverse relationship between the bank deposits/national income ratio (ie the sensitive part of “money”) and the long-term interest rate⁴⁷: Paish thus argued that “money” influenced aggregate demand via the long-term interest rate. Harry Johnson argued that the Bank of England’s technique of monetary control based on Bank rate implemented by open market operations in bills was not very effective. He therefore suggested that open market operations in bonds, not bills, should become the main weapon of monetary policy.

The key conclusion of the Radcliffe Report was that “the structure of interest rates rather than the supply of money [was] the centre piece of the monetary mechanism.” In this, government debt management was to play a central role. The Report concluded with five main points. Among them a clear – and all-too-often overlooked – statement of the importance of the long-term interest rate as an objective of monetary policy.

“There is no doubt that ... monetary policy ... can ... influence the structure of interest rates through the management of the National Debt which, if burdensome to the financial authorities in other respects [ie increasing debt servicing costs], affords in this respect an instrument of single potency. In our view debt management has become the fundamental domestic task of the central bank. It is not open to the monetary authorities to be neutral in their handling of this task. They must have and must consciously exercise a positive policy about interest rates, long as well as short.”⁴⁸

The Report argued that policy reliance on short-rates alone had proved ineffective. It noted that, in one tightening phase in the early 1950s, higher short rates were followed by higher long rates only after a long lag. This lag made the eventual movement in long rates procyclical, rising when the downturn was already beginning. It would have been better to

⁴⁶ Radcliffe (1960), *Minutes of Evidence*, pp 743. Papers submitted by Paish, Johnson, Kahn and Robbins are particularly interesting on this issue.

⁴⁷ Notes in circulation showed no such relationship. See Paish (1960), chart I. Laidler (1989), who described the Radcliffe Report as representing the high tide of Keynesian influence on monetary theory and policy in Britain, points out that Paish did not commit himself as to the stability of this relationship (and so not a monetarist in the modern sense of the term).

⁴⁸ Radcliffe Report (1959), pp 337.

have directly encouraged the rise in long rates right at the beginning of the tightening phase.⁴⁹ Moving all rates up improves the chances of timing countercyclical policy correctly.

The Report explicitly countered the Treasury view on the need to support by bond market by arguing that greater efforts “to foster greater understanding outside official circles ... of the intentions of the authorities would reduce the risk of perverse reactions in the market [from bond sales]”.⁵⁰ How well this advice foreshadows the modern emphasis on effective communication!

Their recommendation for greater activism in moving long-term rates, however, seems to have fallen on deaf ears. With government debt around 130% of GDP, it is perhaps not surprising the authorities were reluctant to countenance any rise in debt servicing costs. In any event, the Bank of England in the 1960s had little time for bond sales aimed at driving up long-term rates.⁵¹ What is worse the authorities in later years actually resisted upward movements in market long-term rates caused by higher inflation or wider budget deficits.

Only the successive crises of the late 1960s and early 1970s put an end to such policy laxity. Monetary aggregates eventually became the centre of policy. Meeting broad money targets from the mid-1970s required not only massive increases in short-term rates but also substantial and regular sales of bonds at higher long-term rates (see Graph 3). A policy of overfunding budget deficits had the express purpose of driving long-term rates higher. The yield on consols rose to a peak of 17% (in November 1974), and did not fall to 10% before the early 1980s.

Whatever the pros and cons of broad *versus* narrow money to guide monetary policy, the broad aggregate at least focused official attention on the link between the financing of budget deficits and financial developments. With a given fiscal deficit, selling or buying government bonds to non-banks was seen as a way of controlling M3. Under “over-funding” policies, such issuance could exceed the fiscal deficit to be financed. In this sense, M3 could be viewed practically as the dual of a target for the long-term rate. Very high nominal bond yields prompted the government to issue index-linked bonds – a move that successfully saved the

⁴⁹ Radcliffe Report (1959), pp 174–7.

⁵⁰ Radcliffe Report (1959), pp 209.

⁵¹ Capie (2010) notes that the Chief Cashier (Fforde) in 1968 had “little time for Radcliffe-style sales of gilts far below the market level. To offer new stock at 7½ or 8% yield when the market rate was 7% was complete nonsense.” The words underlined are those of Fforde (pp 471).

government paying an unjustified (ex post!) inflation risk premium.⁵² (The introduction of inflation-linked bonds had also been proposed by the Radcliffe Report but this too was resisted.)⁵³

Broad money targets were dropped in 1985, and instead the aim became to ensure that the budget deficit was fully funded outside the banking system. By 1990, HM Treasury had explicitly committed itself to the following strong “no monetisation” or “full funding” rule for fiscal deficits:

“The authorities will seek to fund the net total of maturing debt, the Public Sector Borrowing Requirement and any underlying increase in the foreign exchange reserves by sales of debt outside the banking and building society sectors”.⁵⁴

Treasury bills (ie with a maturity of six months or less) were specifically excluded from counting as funding debt sales.⁵⁵ By the mid-1990s, however, this rule had been substantially diluted.

In May 1997, responsibility for government debt management was transferred from the central bank to a Debt Management Office. The Bank of England held, in June 1998, a wide-ranging conference that analysed in some detail the interactions between monetary conditions and the size and structure of government debt. The conference volume illuminates well many of the issues made more prominent by the recent crisis. Goodhart’s historical review demonstrated the close historical links between debt management and monetary policy. He concluded that new instruments such as inflation-linked bonds, better techniques (eg auctions) and better capital market infrastructure meant that “debt management ... and monetary control are seen (for the first time perhaps since 1913) as almost entirely separate and distinct.” But he warned that if liquidity is a key variable affecting nominal expenditures then “the current ‘insouciance’ toward the debt’s maturity structure may be overdone.” Ben Friedman argued that the central bank’s optimal policy rate does, in principle, depend on

⁵² This innovation was ordered in 1981 by Margaret Thatcher, who was enraged “at the Bank of England’s judgement that the market would require a yield of nearly 16% on conventional 20-year bonds.” See “The lessons from the indexed decade.” *Financial Times*, 29 April 1991.

⁵³ In 1998, Barro constructed a model showing that issuing inflation-linked bonds would smooth tax rates in the face of GNP cycles. He also argued that persistent inflation shocks would make long-term nominal bonds more volatile than short-term ones. Hence the government would shift to short-term issues as the volatility of inflation rises. Missale takes a similar perspective: see the references in Missale (1999). Tax revenues rise with cyclical increases in income (real and inflation). Short-term interest rates are also procyclical. Hence short-term debt ensures tax revenue and interest payments move together.

⁵⁴ Enoch and Peters (1992), pp 266.

⁵⁵ Goodhart (1998) provides a detailed analysis of developments during these years, drawing not only on official reports but also on personal correspondence with some key players.

debt management policy and said it was a mistake to make minimisation of the government's interest costs the sole consideration of debt management policy. But he concluded that the magnitudes in a normal business cycle were such that the central bank would be able to change short-term rates to meet its macroeconomic goals irrespective of the structure of government debt.⁵⁶

The conclusion of the Bank of England conference was that, "for most practical purposes, monetary policy can be separated from debt management." King, however, sounded several notes of caution about this consensus. Inflation and the maturity of debt interact in many ways, he said, and the debt "could impact on the inflation process that the government chooses to implement". Neither monetary transmission nor optimal debt management were well understood. He noted that there were few historical examples of extreme changes in debt management policy, which could well have implications for monetary conditions. Hence King expressed "slight nervousness that we might be missing something that will occasionally be important."

(ii) United States: changing fashions

McCauley and Ueda (2009) have shown that a similar "bills versus bonds" debate took place in the United States during the 1930s. The monetarist criticism is that the Federal Reserve should have countered the depression by buying more Treasury securities (bills or bonds) to push short-term rates to zero and to provide the banks with excess reserves. Keynes said the Federal Reserve should buy long-dated Treasury issues.⁵⁷ The Keynesian view was taken by the President of the Federal Reserve of New York who argued that purchasing bonds could "lower long-term rates, increase loans to foreigners and thus stimulate exports". The Federal Reserve bought \$1 billion in 1932: and, according to Anderson (2010), continued what was in effect Quantitative Easing during 1933–36.

Wartime finance followed similar lines as those in the United Kingdom. The Federal Reserve's wartime mandate to keep long-term rates low and stable (at 2½% for 25-year Treasuries) ended only in 1951. In fact, an informal commitment prevailed for many years. Given a positively sloped yield curve, the objective of lowering interest payments has generally involved shortening the average maturity of debt or relying on floating-rate debt. The United States continued to rely to a significant extent on short-term debt for much of the 1950s and 1960s. A legal ceiling of 4¼% on the rate the Treasury could offer on long-term

⁵⁶ See Bank of England (1999).

⁵⁷ Tily (2010), pp 69–76 provides an account of this debate.

bonds constrained issuance. Only from the mid-1970s, as the 4¼% ceiling was progressively relaxed, did the US Treasury begin a policy of gradually increasing the average maturity of debt. By 1980 the average remaining maturity of US government debt was still less than four years (compared with more than 12 years in the United Kingdom).

Graph 6 charts the average maturity of US government debt during the past 30 years – in terms of both the outstanding stock and issuance.⁵⁸ It is striking how large the swings in the average maturity of debt have been. It is therefore rather odd that the macroeconomic causes and impact of these significant changes have attracted so little formal analysis.

The 30-year bond was first issued in 1977 and came to fund a significant proportion of Federal government borrowing. This contributed to a lengthening of debt maturity during the 1980s, save for the period after the 1987 equity market collapse. By the early 1990s, however, the US government was again arguing that shortening the maturity of debt would produce significant savings on interest costs.⁵⁹ But the most notable phases of debt maturity shortening were from late 1993 to 1996 (the bond market crisis of early 1994 cast a long shadow) and between 2000 and 2004 (when monetary policy also turned more accommodative).

In October 2001, the US Treasury announced it would no longer issue the 30-year bond. This decision was criticised by bond market investors because it deprived them of a long-term, risk-free product that was a useful benchmark for corporate bonds. Against this, it was argued that flight-to-quality considerations (largely arising in the rest of the world) and dwindling supply had already undermined the usefulness of Treasury bond yields in providing a benchmark for the pricing of other securities (Cecchetti, 2000). In any event, the average maturity of Federal government debt was reduced from 6 years, 2 months to just under 5 years in 2004. Issuance of 30-year bonds restarted in 2005. By 2010, annual issuance exceeded \$160 billion, far greater than in the past (Graph 7).

(iii) A simple statistical test

Have these swings in the average maturity of debt over the past 30 years been related to macroeconomic policies? As there does not seem to be much empirical analysis of this question,⁶⁰ I tried a naïve regression of the year-to-year change in the average maturity of

⁵⁸ An authoritative historical review is Garbade (2007).

⁵⁹ See Campbell (1995). As discussed further in Section 8 below, the US Treasury is at present aiming to lengthen the maturity of its debt.

⁶⁰ With the notable exception of Hoogduin et al (2010) discussed in Section 6 below.

bonds outstanding in months (labelled ΔAVMAT) on two simple policy variables: the Federal funds rate (R) and the Federal deficit/GDP ratio (DEF%GDP). The regression was run on annual data over the period 1982 to 2010. The Federal deficit as a percentage of GDP, which is not known immediately, is lagged one year. Dividing this period into two halves yielded significantly different intercept terms (while the coefficients on the independent variables were not different). This suggests that, irrespective of movements in the independent variables, the average maturity of bonds outstanding tended to fall more rapidly during the first period. To allow for this, a dummy intercept (D) was added (D = 1 for 1982 to 1995 and = 0 for 1996 to 2010).

The result was:

$$\Delta\text{AVMAT} = -4.5 - 3.45 \cdot D + 0.82 \cdot R + 78 \cdot \text{DEF\%GDP}(-1)$$

(4.1) (2.6) (4.0) (3.6)

Adj $R^2 = 0.47$; F = 7.3; DW = 0.91; t-statistics given in parentheses

The simplicity of this regression result came as a surprise. Further statistical work is clearly required (other variables such as debt levels should be tested, different lag structures might work better, the presence of serial correlation means that standard errors are understated etc). Nevertheless, this equation provides prima facie evidence that the maturity of outstanding debt is usually shortened when the Federal funds rate is low. This may show the fact that debt managers deliberately take advantage of unusually low near-term market rates when the central bank's policy stance is accommodating. In this sense, debt issuance and monetary policy work in the same direction.

The sign on the fiscal variable suggests that a larger fiscal deficit tends to be associated with a lengthening in maturities. Debt managers often say that longer maturities are indeed needed to spread out higher debt over longer time periods.

This empirical link between debt management choices and two simple measures of both fiscal policy and monetary policy suggests that debt management choices have in practice been endogenous with respect to macroeconomic policy. This clearly requires more research. If these macroeconomic links are robust (eg to different countries, to different time periods), the implications for policy frameworks are significant.

6. The macroeconomic policy focus of government debt management

This endogeneity means we need to look more closely at how the mandate is given to the government debt manager. In theory, the mandate assigned to the government debt manager could address macroeconomic aspects in several ways. At one extreme, the Treasury could, once a year, give its debt manager a maturity objective that is consistent with the government's current macroeconomic objectives. At the other extreme, the mandate could be defined in a way that makes it exogenous to macroeconomic and monetary developments. The debt manager could be told, for instance, to ensure that the average maturity of outstanding debt should always be round x years, subject to some (narrow) operational leeway. The efficient markets view of the world might condone such a mandate: debt management offices could not know better than the markets.⁶¹ They would be told to do this irrespective of the current market configuration of interest rates.

In practice, however, the debt manager is usually given some discretion to minimise debt servicing costs in some way. Its actions therefore become endogenous to macroeconomic and monetary developments. The previous section provided some very simple evidence of such endogeneity in the United States over the past 30 years. In truth, such endogeneity is likely to be complex, time-variant and opaque. And the discretionary actions of the debt manager would have macroeconomic consequences. How large these would be would depend on the degree of asset substitutability. In normal market circumstances, the macroeconomic consequences of limited changes to debt maturities would be quite small.

Debt managers could simply think of minimising average debt costs over a given horizon. If investing long is a wise investment strategy for a long-term investor (because of the term premium), then equally issuing short-term debt should in theory save the government's debt manager this term premium. Indeed, Piga (2001) reports that government do believe they can reduce the average cost of debt by shortening the duration of their debt. As noted by Piga, this could be efficiently implemented with interest rate swaps (perhaps maintaining the appearance of long-dated issuance).

A more complex strategy would be to exploit historical interest rate patterns to decide in a discretionary way on duration.⁶² This will not be easy: yields on bonds have shown wide

⁶¹ On this, see Blommestein (2009).

⁶² Hoogduin et al (2010) show that, in the euro area, a steepening in the yield curve leads national debt managers to shorten the duration of their issuance.

long-term swings that are not well understood. But some patterns have been detected. For example, one important – and apparently robust – result quoted by Goodhart (1989) is that:

“With short rates moving down ... the long rate on balance has tended to fall when the yield curve is upwards sloping ... so that there are excess returns to be made by investing long when the yield curve is upwards sloping ... the term structure [completely fails] to predict the future short-term path of interest rates ...”.

Conversely, the debt manager in such circumstances should – on this logic – issue short. A similar reasoning applies if market expectations about inflation or growth adjust too slowly to deteriorating economic conditions. (How successful debt manager have actually been in minimising debt service does not seem to have been the subject of much research).

So far nothing has been said of the variance of expanded financing costs. Shortening the duration of debt in order to minimise the average cost of borrowing could increase the variability of interest payments in future years. Taking account of the variance of expected financing costs favours longer-term issuance. The variance of costs depends on the time horizon chosen. To put the point at its simplest: the variance of expected financing costs is minimised over a horizon of x years by issuing a bond with a maturity of x years. In addition, the creditworthiness of the borrower could deteriorate and increase refinancing risks.

Such considerations worry a private sector borrower who cannot count on access to perfect capital markets in all circumstances. Moral hazard and adverse selection stemming from information asymmetries mean that even solvent private firms could face greater barriers to getting credit during a downturn. But governments do not face the same refinancing risks because of their sovereign power to tax and because central banks can issue money.⁶³ As Keynes put it, a “counter-liquidity preference has more meaning for the private borrower than for the Exchequer.” Woodford (2000) points out that markets – irrespective of the logic of an intertemporal budget constraint for governments (which is debatable) – treat government debt differently from private sector debt because government debt “is just a promise to deliver more of its own liabilities ... [cash being] simply government liabilities that happen to

⁶³ This is an argument for *short-term* recourse to taxation or money expansion to forestall a refinancing crisis – it is NOT an argument about medium-term fiscal choices. In addition, the argument obviously only applies to local currency denominated debt. It would not be true where such sovereign powers are not strong enough to avert the risk of default on foreign currency debt.

be non-interest-earning.”⁶⁴ No private firm can do this. Governments therefore have great latitude to effect big changes in the maturity of their debt.

Nevertheless, excessive dependence on short-term debt could have several drawbacks. It could complicate at least the communication of fiscal policy. It would make government debt service expenditure more sensitive to changes in short-term rates. In conditions of large debts to refinance, the budget deficit would thus become more volatile and uncertain – and this uncertainty could make it difficult for a government to communicate its fiscal strategy.⁶⁵ This problem would be exacerbated if markets were to see a higher risk of sovereign default as a result of increased interest rates.⁶⁶

A second, and related, drawback applies to monetary policy. The prospect of increased debt servicing costs could lead to government pressure on the central bank not to increase policy rates. It may even weaken the effectiveness of changes in policy rates as an instrument to stabilise aggregate demand. This is because higher rates increase the net interest income of the private sector which holds the bonds. This stimulates private domestic demand but does not restrain government spending. In extreme circumstances, changes in the policy rate could have perverse effects, with higher interest rates actually stimulating aggregate demand. This was an important issue in some industrial countries in the late 1980s and early 1990s.⁶⁷ Many developing countries have faced a situation of monetary policy having perverse effects.

Severe or tail-risk adverse shocks could well aggravate these fiscal and monetary complications. The exceptional shock to global demand in the 2007 financial crisis is one example. A loss of confidence could lead to a sharp rise in borrowing costs that could require a huge adjustment to either taxes or non-interest spending. Massive monetary easing would be required to offset deflationary forces. But it would be hard to know in advance how large “massive” would be – so the central bank could make a policy mistake. Governments may wish to avoid such outcomes. (Another, more political, aspect is that the electoral cycle could

⁶⁴ Equally it should be noted that calculations of short-term financing requirements of countries become very visible in the financial press during times of crisis – suggesting bond investors do focus on how refinancing risks differ from country to country.

⁶⁵ If debt levels are low, however, there is an argument that an increased dependence on short-term debt could offset cyclical movements in tax revenue – and thus stabilise the budget deficit. See footnote 53 above.

⁶⁶ In this case, the premium required to hold domestic government debt would rise. Blanchard (2004) points out that in this case, higher policy rates could perversely lead to currency depreciation and higher inflation.

⁶⁷ Italy faced this situation in the late 1980s. A BIS report of a meeting in 1991 noted that this was a real issue. “Appropriate degrees of monetary tightness might lead to undesirable increases in the budgetary costs of debt service. This could obviously work against budgetary consolidation and fiscal sustainability; in the extreme it might even mean that the net aggregate demand effects of monetary tightening could become perverse.” See BIS (1992).

lead governments to take short-sighted financing decisions which generate immediate budgetary savings but create longer-term exposures. In some instances, a heavy refinancing burden could await an incoming government.)

The third, and perhaps decisive, argument applies to financial stability. As Keynes argued, the government acts as a stabiliser when it adapts to the (shifting) liquidity preference of the public. Market participants need a risk-free yield curve to manage their own maturity transformation risks. Pension funds and life insurance companies, for instance, need very long-term bonds to hedge long-term liabilities. Concentrating issuance at the short end, or driving long-term rates to near zero, would sacrifice this stabilising function.

These macroeconomic considerations suggest that long maturity debt in normal times is therefore desirable. But this does not weaken the case for adjusting issuance maturities in response to exceptional cyclical developments. Indeed a government with longer-dated debt at the onset of a crisis is better placed to conduct countercyclical maturity shortening than one which enters a recession with short duration debt. Exactly as budget surplus in good times increases the room for fiscal manoeuvre in bad times!

7. More activist debt management policies ...

The main conclusion of the last section was that debt management policies could well be adjusted to serve fiscal, monetary and financial stability objectives. It would be quite wrong to conclude, a priori, that such adjustments necessarily amount to policy laxity. Fiscal policy goals could be made more ambitious. Stimulating demand by shortening the maturity of government debt could increase the room for cutting non-interest expenditures. This would permit a faster reduction in budget deficits. Iwata (2010), for example, argues that Japan should address its twin problem of deflation and fiscal deficits by combining stepped-up Quantitative Easing with a gradual reduction in the budget deficit.

Financial stability policy objectives could also be furthered. Debt management operations could encourage banks to borrow in capital markets at longer duration – reducing their exposures to maturity risks. But financial stability could also be undermined if long-term rates are pushed too low (the Keynes/Tirole arguments, overvalued asset prices etc).

Altering the long/short mix of government debt issuance on macroeconomic or prudential (as well as cost-effectiveness) grounds would require significant changes to the rules – on limits, on timings of changes etc – that govern debt management policies. At present, such policies in most countries have a narrower, more technical focus – although, as argued above, they still respond endogenously to macroeconomic developments. How a broader focus that is

attractive in theory would work in practice is hard to judge. Difficult or not, governments faced with financing such massive debts will ask this question.

One central empirical question is how large would be the macroeconomic impacts of more activist debt-management policies. How far would shortening the maturity of issuance flatten yield curves? It all depends on the strength of portfolio-balancing effects because short-term and long-term debts are imperfect substitutes. For the reasons discussed above, substitutability will not be uniform either across countries or over time. The experience of one country will not necessarily be a good guide to what would happen in another country. What works in one episode will not necessarily work in another. Nevertheless, it is not difficult to imagine circumstances in which such policies can be highly effective. In times of crisis, for instance, a large (but temporary) decline in asset substitutability (because of greater macroeconomic uncertainty, banks with weakened balance sheets less able to take interest rate risks etc) will make activist debt management policies more effective.

Policy implications will differ accordingly. If the impact on yield curves is very small, then the short-run fiscal dividend can be significant because the potential impact on government interest payments of replacing higher-yield long-dated paper by low-yield short-dated paper will be large. If the impact on long-term rates is very great, then the government's immediate fiscal dividend will be smaller: its actions will shift the yield curve in a direction that limits the impact on government interest payments.

But a big effect on the yield curve might serve the other public policy purposes. A successful attempt to bring long-term rates down would stimulate aggregate demand and might help financial stability. Even the announcement of such a policy could influence market interest rates by signalling the future financing intentions of the government. This could happen well before the structure of outstanding debt actually changes very much.

... or central bank balance sheet policies

All this of course sounds very like QE by the central bank. Operations in debt markets work by changing the size or composition of official sector debt held by the private sector. The purchase of long-term government paper by the central bank which issues short-term debt is fundamentally equivalent to the government shifting from long-term to short-term issuance. Internal Treasury/central bank book-keeping operations do not alter this.

Recent studies measuring the impact of QE are summarised in Table 3. The impacts estimated by various studies vary significantly. Gagnon (2009) notes that recent empirical studies of the impact of Federal Reserve purchasing of long-term assets produce estimates

of a similar size to earlier studies of comparable changes in Treasury debt issuance.⁶⁸ Bean et al (2010) note that UK asset purchases did not affect the expected path of the Bank of England's policy rate – hence the primary effects must have been through the portfolio rebalancing channel (as Tobin, Friedman and others argued in their early analysis) and not through the signalling of future policy rate intentions.⁶⁹

What matters is how radically changes in central bank purchases (or Treasury issuance) alter private sector portfolios. Buying very short-term Treasury securities has little effect because such paper is a close substitute for money. Buying long-term government debt, which is less close as a substitute, will disturb private sector portfolios more fundamentally. Hence the portfolio rebalancing effects will be larger when longer-dated paper is purchased.

Are there any qualifications to the fundamental equivalence of Treasury and central bank action? Some worry that central bank losses from declines in the market value of government bonds could weaken the central bank. In principle, central banks need not worry about a subsequent market value loss of government bonds they purchase because it is exactly offset by a reduction for the government in the market value of its debt. The net effect for the official sector as a whole is nil.

Another qualification would be if book-keeping operations were to influence behaviour. It is not difficult to conceive of such circumstances. For instance, central bank purchases could encourage governments to believe they could finance larger budget deficits. The market's judgement of a central bank's ability to act – and thus its credibility – could be constrained by its balance sheet. And political economy considerations could be important. Ueda (2003) stresses the political constraints on government that are not captured by the consolidated balance sheet of the central bank and government. Because of the diversity and complexity of interests which come into play in the government budgetary process, the Treasury prefers the transfer of a stable stream of profits from the central bank.⁷⁰

⁶⁸ He finds that \$1 trillion of purchases drives down long-term yields by 39 basis points and that such effects appear to be long lasting.

⁶⁹ They cite Joyce et al (2010). They also discuss other UK studies: Meier (2009) finds that the Bank of England's £125 billion purchase of long-term bonds reduced longer-term bond yields by between 40 and 100 basis points.

⁷⁰ Ueda (2003) writes: "The single year budgeting principle and the diversity and complexity of interests within the government give rise to huge inter- and intra-ministry negotiation costs when reshuffling is required between different categories of expenditure and revenue ... Compensating for any shortfall [in transfers from the central bank] with other revenue items would inevitably entail adjustment costs ... More seriously, the government may take advantage of the opportunity of capital injection to the central bank to influence monetary policy." Klüh and Stella (2008) provide cross-country evidence that a strong central bank balance sheet helps the achievement of lower inflation.

A second qualification is that operations with banks conducted by the central bank and those with the non-bank public conducted by the Treasury may have different effects. Such differences, however, depend on how the non-bank public changes its bank balances in response to Treasury sales.⁷¹ If it simply reduces its bank deposits then the effects are similar as operations vis-à-vis banks. This merits further research.

A third qualification, and perhaps of most significance, is that the Treasury/central bank signalling effects might be different. Central bank action sends a signal about future policy rates. Much recent research has focused on this. But debt management decisions also send a signal about the nature of future Treasury financing (and government communication strategies could amplify such a signal). Action by the central bank and the Treasury could both trigger powerful expectational effects. But there may be another difference in signalling. The financial press may give inordinate coverage to central bank actions (as with the Federal Reserve's QE in November 2010) – but overlook the equally important but less visible actions of debt management offices.

8. Mandates, accountability and policy consistency

Central bank purchases of government bonds on a large scale will revive an old debate about the role of the central bank in government debt management.⁷² In many countries, the central bank historically was the government debt manager. Indeed, Goodhart (2010) argued that a review of central banking through the years suggests that the essence of a central bank is not setting official rates. It is instead its ability to lend via open market operations. Exactly which assets it should buy and sell is controversial and has in practice changed radically over time.

(i) Separate mandates for the central bank and the DMO

There are problems with giving central banks the dual mandate of both setting monetary policy and managing government debt. Trying to keep debt service costs down (or even limiting the volatility of such costs) can conflict with the monetary policy need to adjust interest rates in the light of changing economic conditions. Even market perceptions of such a conflict could affect inflation expectations. Another conflict of interest is that advanced

⁷¹ See Congdon (2010) and Box 1 in McCauley and Ueda (2009).

⁷² It is interesting that Milton Friedman, in commenting on an earlier version of Congdon (2010), did not say this was a fiscal responsibility, but instead said that the central bank could perform such operations.

knowledge of its interest rate decisions could induce a central bank to bring forward bond issuance ahead of a rise in interest rates. For this reason, the market may “read” future monetary policy decisions from debt issuance practices.

By the mid-1990s, therefore, a growing appreciation of the dangers of policy confusion created by unclear mandates led to an international consensus that government debt management policy deserved specific attention in its own right. The debt management function in many countries was made less discretionary. Clear objectives were assigned (usually to minimise expected costs subject to pre-defined risk tolerance limits). The philosophy behind this and related reforms was that predictable policy frameworks should help to stabilise expectations. The whole process of government debt issuance was made more transparent. (At least in theory – in practice, the greater use of derivatives often reduced the information content of reported balance sheets.) In many countries, this realignment of policy frameworks went together with the independence of central banks with clear inflation mandates. And the operational responsibility of managing government debt was removed from the central bank and given to an independent Debt Management Office (DMO).

There is no doubt that these reforms helped to make government debt markets work better, and lower long-term borrowing costs for governments. The drawback, however, was that few countries seem to have established mechanisms to ensure the consistency of Treasury, central bank or debt office policies.⁷³ At the risk of some oversimplification, potential policy conflicts under these new arrangements between debt management and monetary policy could be avoided by following two broad principles:

- Central banks should not operate in the markets for long-dated government debt, but should limit their market operations to the bills market.
- Government debt management should be guided by cost-minimisation mandates, and not by macroeconomic developments. Issuance of short-dated debt should be minimal.

In normal times, these principles conveniently simplified the lives of policymakers in central banks and in debt management offices. They allowed each institution to be held accountable for distinct mandates. And they provided some insulation from short-term political pressures. But the large stock of government bonds on the balance sheets of central banks and the greater uncertainty about future interest rates will undermine some key assumptions that lie behind these two “separability” principles.

⁷³ These changes are further discussed in Turner (2011): the main references are BIS (2000), Piga (2001), Wheeler (2004), OECD (2005) and Garbade (2007).

(ii) Macroeconomic objectives and policy consistency

Activism motivated by macroeconomic objectives in both debt management policies by the Treasury (or DMO) and central bank balance sheet policies would create coordination problems. A central bank could not take optimal decisions in response to macroeconomic developments if it did not take account of how the Treasury would respond. It would also pose a major governance issue about responsibilities and accountabilities. As Truman (2005) has argued, the two agencies managing a common balance sheet must work closely together.

On this logic, cooperation between the central bank and the Treasury should not be constrained by rather arbitrary rules of thumb.⁷⁴ The debate turns on the practical question whether such rules, given political or institutional constraints, could serve to forestall short-sighted policies that weaken accountability mechanisms that hold specific institutions to their mandates. This important practical question is beyond the scope of this paper.

Without mechanisms to ensure the consistency of different policies, QE operations decided by the central banks could well be contradicted by Treasury financing decisions. Remember that the government's balance sheet is much larger in normal times than that of the central bank. The central bank's balance sheet is more elastic perhaps; but if its policies just induce the opposite reaction of the debt manager (the endogeneity point argued above), its theoretical elasticity will have less practical effect. According to a report issued in August 2010, the US Treasury has been lengthening the average maturity of its outstanding debt (after steady declines from 2002 to 2007) – which is difficult to square with the objectives of QE.⁷⁵ This seems very reminiscent of the famous “Operation Twist”.⁷⁶ When the Federal Reserve used open market operations to flatten the yield curve by shortening the average maturity of Treasury debt in the early 1960s (Operation Twist), the US Treasury in effect worked against this policy by lengthening the maturity of issuance.

⁷⁴ His trenchant words, pre-dating recent central bank balance sheet activism, are worth quoting: “The proposition that a central bank should limit its purchases of long-dated government debt because not to do so would impair its balance sheet and de facto independence [is incorrect] ... as long as the central bank purchases long-dated government obligations in the open market, and has no obligation to roll them over, the central bank should have no legislated or self-imposed limit on the amount of such obligations it may purchase.” But see the counterargument of Ueda (2003), cited in footnote 70 above.

⁷⁵ See US Treasury (2010a). See Friedman (1992). Congdon (2010) argues that the Japanese Ministry of Finance also continued to sell vast quantities of long-dated paper during the quantitative easing period 2001 to 2005. See also McCauley and Ueda (2009).

⁷⁶ Chadha and Holly (2011) estimate that the Federal Reserve's purchases of \$8.8 billion under this programme is the equivalent of \$225 billion when scaled at today's GDP.

Both the adoption of, and exit from, QE would require coordination with the Treasury. If the aim is to stimulate aggregate demand, government debt management policies should not cancel out the effect of QE operations. If the aim is to adjust the central bank's balance sheet without weakening aggregate demand (eg as might be the case for exit from QE), then debt management policies could well offset central bank sales or purchases of government bonds.

It is therefore essential to examine recent QE in conjunction with government debt management policies. Some historical perspective is also illuminating. Because measures recently adopted have taken so many diverse forms (reflecting the specific features of this crisis), it is not possible to do this with any precision. Nevertheless, updating the first table in Tobin's 1963 paper – which summarised the structure of Federal government debt in the hands of the public – provides an illuminating bird's-eye view. See Table 4. There is, of course, a highly stylised characterisation of the monetary impulse of changes in debt maturity. But it is a starting point.

At the end of World War II, US government debt was mainly long-term: in 1945, the mean maturity of the marketable debt was just short of 10 years. But for the 30 years following the war, the US Treasury relied on short-term borrowing. In 1955, 45% of the debt was financed by currency, central bank obligations and short-term government debt – often dubbed “monetary financing”.⁷⁷ By the end of the 1960s, monetary financing has risen to 65%. From 1976 until 1990, however, greater reliance began to be put on issuing long-term debt.⁷⁸

In the years immediately before the crisis, the average maturity of government debt was broadly constant. With the adoption of QE after the crisis, however, reliance on short-term debt and Federal Reserve obligations was increased. Between the end of FY2007 and the end of FY2009, currency and Federal Reserve obligations more than doubled. Short-term marketable securities outstanding also doubled. An expansion in money and short-dated paper of \$2 trillion. This clearly represents a very significant easing of policy. What might be called “monetary financing” in the first two years of the crisis went from 34% to 43%. But note that the degree of monetary financing – as measured in these simplistic terms – is still much less than in 1969. The longer duration of debt at the beginning of the crisis gave the authorities greater scope to pursue an ambitious QE policy.

⁷⁷ Hoogduin et al (2010), for instance, describe the case of the Netherlands: “In the 1980s, government debt finance was an explicit part of the monetary analysis of De Nederlandsche Bank ... when the government financed part of its debt in the money market, it was considered monetary financing, which would increase the amount of liquidity in the economy.”

⁷⁸ The post-war minimum in average maturity was reached in January 1976 when it reached just 28 months. See Friedman (1992) pp 111–2.

But in the third year of the crisis, the maturity of Treasury debt issuance changed in a restrictive direction.⁷⁹ The calculation suggests that the degree of monetary financing declined from 43% at end-September 2009 and to 36% at end-September 2010. This reflects an underlying shift in Treasury issuance away from short-term paper and towards long-dated paper. The average maturity of total marketable debt rose from 4 to almost 5 years (Table 5).

Box 2
QE 2 by the Federal Reserve

The FRBNY announced on 3 November that it expects to purchase \$850 to \$900 billion of longer-term Treasury securities before the end of June 2011. It expects that the assets purchased will have an average duration of five to six years. The 35% limit on Federal Reserve holding of specific issues, under which the Open Market Trading Desk had been operating, would be relaxed.

The press announcement said that the Desk plans to distribute purchases across maturity ranges according to the approximate weights below:

- 5%: 1½ - 2½ years
- 20%: 2½ - 4 years
- 20%: 4 - 5½ years
- 23%: 5½ - 7 years
- 23%: 7 - 10 years
- 2%: 10 - 17 years
- 4%: 17 - 30 years
- 3%: TIPS

Purchasing mechanisms were spelt out in a very transparent way. The results of each operation will be published on the FRBNY's website shortly after each purchase operation has concluded. The Desk will also begin to publish information on the prices paid in individual operations at the end of each monthly calendar period, coinciding with the release of the next period's schedule.

On 3 November 2010, the Federal Reserve announced a special programme to buy between \$850 and \$900 billion longer-term Treasury securities. The announcement was remarkable for the detail provided to the markets in the interest of transparency: see Box 2. This number sounds very large. It is, however, not possible to assess the impact of this without considering changes in Treasury issuance policy. This is not straightforward. There is a wide array of maturities (not just short versus long) and this makes it difficult to construct a detailed consolidation of central bank and Treasury balance sheets. And the composition of the expansion in Treasury bond issuance (and of bill issuance) over the period up to June 2011 needed to finance a large budget deficit is, at present, unknown.

⁷⁹ Part of the swings in Treasury bill issuance presumably reflects the rise and subsequent fall of the Treasury's Supplementary Financing Program (funds borrowed on behalf of the Federal Reserve) in support of the Federal Reserve's crisis-related financing.

However, the minutes of the 2 November 2010 meeting of the Treasury Borrowing Advisory Committee noted:

“Overall, the Committee was comfortable with continuing to extend the average maturity of the debt ... The question arose regarding whether the Fed and the Treasury were working at cross purposes ... It was pointed out by members of the Committee that the Fed and the Treasury are independent institutions, with two different mandates that might sometimes appear to be in conflict. Members agreed that Treasury should adhere to its mandate of assuring the lowest cost of borrowing over time, regardless of the Fed's monetary policy. A couple members noted that the Fed was essentially a "large investor" in Treasuries and that the Fed's behavior was probably transitory. As a result, Treasury should not modify its regular and predictable issuance paradigm to accommodate a single large investor.”⁸⁰

In their February 2011 meeting, the Committee “felt strongly that the longer-term fiscal challenges warranted further progress on [increasing the average maturity of marketable debt]”.⁸¹

Almost all recent press commentary on QE ignores this critical point about the need to take account of Treasury issuance policy. A temporary change to the yield curve induced by central bank action may lead the debt manager to alter its issuance policy to take advantage of what it might view as a temporary interest rate “distortion”. Or it may find it can move quickly to attain a pre-existing maturity-extending objective thanks to favourable market conditions created by the central bank. Either way, it responds endogenously to the repricing of debt caused by the central bank. Ironically, part of the discussion in the Treasury Committee centred on whether further shrinkage of bills issuance, at a time when private issuance of short-term debt securities had declined, could lead to difficulties of market functioning.

9. Conclusion

Public sector debts in the advanced countries are going to be very large for several years. This could have big implications for how central banks set monetary policy. The issue is not fiscal dominance in the simplistic sense of “inflating away the debt”. But there is a more

⁸⁰ See US Treasury (2010b).

⁸¹ See US Treasury (2011).

subtle dominance that comes from increased uncertainty about inflation and the equilibrium long-term interest rate on government debt.

The desire to save debt servicing costs is likely to prompt a re-examination of policy frameworks that guide government debt management policies. More activist debt management policies aimed at keeping long-term interest rates low during a period of weak or uncertain growth could well be warranted on macroeconomic grounds. Indeed, Keynes argued strongly for such policies at the start of the 1930s. Tobin argued in the 1960s that shortening the maturity of government debt would increase private capital formation, a result confirmed by Ben Friedman's simulations in the early 1990s. As Kazumasa Iwata has argued in the Japanese context, combining fiscal consolidation with significant reductions in the duration of government debt may well be an attractive strategy for governments struggling to reduce large budget deficits without killing the private capital formation on which future growth prospects depend.

Equally, the authorities may want to push long-term rates higher if inflation risks increase. Economists throughout the post-war period periodically argued for lengthening the duration of bonds in the hands of the public (ie not the central bank) in order to raise long-term rates to combat inflation. The *Radcliffe Report* was quite explicit that the central bank should push up the whole yield curve when it wanted to tighten monetary policy, and "not just wait for the belated and imperfect reactions from the price of short-term debts".

The case for central bank transactions in long-term debt markets, rather than acting only in the short-term bills market, is stronger whenever there is increased investor uncertainty about the path of future short-term rates. Large government debt increases uncertainty about future inflation. If uncertainty were only about inflation and nominal interest rates, then one answer would be to increase issuance of inflation-linked debt. But the fiscal situation is likely to entail increased uncertainty about real interest rates also. This will reduce the substitutability between short-dated and long-dated paper. In such circumstances, central banks may more efficiently guide markets if they act across the maturity spectrum. This case for such action, which is broader than the special case of the ZLB, applies symmetrically to monetary restriction and to monetary expansion.

Central banks will also have to weigh macroeconomic objectives against the consequences for financial stability. A policy orientation aimed at keeping long-term interest rates low for a prolonged period of time is going to increase aggregate interest rate risks in banks and other financial institutions. How to analyse the financial stability risks that such exposures entail is unclear. But such exposures seem likely to have financial stability consequences that will directly impinge on the new, broader mandate of central banks. In theory, it is possible that

central banks can adjust regulatory policies (“macroprudential”) that limit the aggregate maturity exposures that low interest rates encourage. In practice, however, regulatory action partly geared to macroeconomic conditions will be difficult to calibrate and to implement – and may even weaken the responsibility of financial firms for managing their own exposures.

By putting balance sheet policies at the centre of their operations in the current low-interest-rate environment, many central banks – not all of course – have implicitly accepted the logic of Keynes’s position. The recent evidence suggests that balance-sheet-augmented monetary policy has been effective. But there are grounds to treating such estimates sceptically. Most studies fail to take account of contemporaneous changes to government debt management policies which are equivalent to central bank transactions in government debt. In addition, there are reasons for thinking that the size of such effects – depending as they do on the cyclically sensitive degree of asset substitutability and on the ability of banks to assume interest rate exposures – are likely to vary over time. Because these effects will be very hard to predict, policy setting will have to be flexible and adaptive.

On top of all this, the appetite of large forex reserves holders in Asia and other EMEs for low-risk dollar debt has also put downward pressure on long-term yields. Because many central banks accumulating reserves have not followed strict “no monetisation” rules (cf the UK Treasury’s full funding rule cited above), this intervention has entailed monetary expansion and contributed to an expansion in bank credit. The controversy concerns just how much monetary expansion since there is no widely agreed way of measuring “monetisation”. In addition, low long-term rates at the centre of international monetary system in turn influence the pricing of debt (and asset prices generally) in the EMEs, leading to local policy reactions.

Measuring the joint impact of these two, quite distinct policy orientations is, for all these reasons, impossible. Hervé Hannoun (2009) suggests, as a rough-and-ready calculation, adding central bank assets in advanced economies to foreign exchange reserves of the major EMEs. On this calculation, what he terms “global official liquidity” has risen from about \$7 trillion in mid-2007 to around \$12 trillion by mid-2010.

Official support for government bond markets on the present scale is not sustainable. Hannoun warns strongly against a “new permanent accommodative monetary policy regime in which central banks would be able and willing to control the entire length of yield curves as well as credit spreads and mortgages rates”. The intention of central banks in the advanced economies to shrink their balance sheets to more normal levels once circumstances permit has been well advertised.

Yet the reassuring argument that only once-in-a-century circumstances led central banks to such policies is unconvincing. Monetary history is full of periods when investors become markedly uncertain about the path of future short-term rates. A very large rise in government debt accentuates such uncertainty. Financial stability considerations point to the same conclusion: the sizeable interest rate exposures of systemically important financial intermediaries may also be used as an argument for resisting sudden upward movements in the long-term interest rate during monetary tightening. Central banks may simultaneously be raising the policy rate and yet still be active in supporting the market for government bonds. Even when the current policies have been reversed, future periods of macroeconomic weakness may well lead to pressure for their reinstatement. Balance-sheet-augmented monetary policy once billed as exceptional may instead come to define a new starting point ... or, to be more accurate, to return to some earlier paradigms of monetary policy.

There is, therefore, a need to develop a policy framework for official actions motivated by macroeconomic considerations that affect the maturity structure of government debt. Without such a framework, even rational policies that economic theory suggests will work may just deepen uncertainty. Markets need to understand what governments or central banks are trying to do.⁸²

How should the objectives of such policies be formulated? The target could be specified in terms of quantities as in the case of recent Federal Reserve operations. Or it could be in terms of establishing a corridor for prices (ie interest rates). Operations could be spread across the maturity spectrum (to minimise distortions along the yield curve) or could focus on specific maturities. Operations could concentrate on medium-term paper (so that the bonds automatically run off the central bank's balance sheet earlier) or on very long-term paper. It might be necessary to indicate in some way the conditions that would trigger the adoption (and the reversal) of such policies. The "real intention" of policy may be complex and state-contingent: a central bank might find itself having to communicate simple if not fully accurate messages. Should such policies be symmetric, to be used to achieve or to accelerate macroeconomic policy tightening as well as easing?

Historically there has been strong official resistance to central banks selling bonds when governments have heavy debts to refinance. What is the division of responsibility between the Debt Management Office (or Treasury) and the central bank? Should Debt Management

⁸² Blommestein et al (2010) note that discussions in April 2010 at the OECD-WBG-IMF's Global Bond Market Forum underlined the importance in current circumstances of massive government bond issuance of "managing investor uncertainty".

Offices be more transparent, for example revealing how changes in their derivatives positions have altered their interest rate exposures? It is not difficult to think of many other questions. The problem with all policy innovations (particularly those decided in the heat of a crisis) is that they can create additional uncertainty for the private sector.

The need for a well-articulated policy framework is all the more necessary when very large structural budget deficits threaten to weaken the policy credibility of governments and central banks on all fronts. Long-term rates are all dependent on expectations – about future fiscal deficits and debt levels, about their financing and about the anti-inflation commitment/efficacy of monetary policy. Greater and asymmetric activism to address immediate difficulties could ultimately destabilise countries with weak macroeconomic credibility (fundamentals or history). When monetary tightening is needed to resist inflationary pressures, central banks may in some circumstances wish to reinforce increases in the policy rate with sales of government bonds so that long-term rates also rise. Deciding on the volume and the timing of such sales will be difficult. Ensuring broad consistency with government debt management policies that are not in the hands of the central bank will create challenges not only in the implementation but also in the communication of policies affecting the consolidated balance sheet of government and central bank.

This paper has tried to show that this is an old and controversial issue. It calls into question a number of widely-held assumptions about monetary policy. The macroeconomics of government debt management (or central bank government bond purchases) needs to be better understood. More research is needed to measure the quantitative significance of the possible mechanisms at work. Account must also be taken of financial stability objectives. The linkages between monetary policy, debt management policy and financial stability policy may be of second order importance when expectations of future real and nominal interest rates are well-anchored by strong fiscal positions and credible policy frameworks. But they cannot be ignored when government debt/GDP ratios will be very high for years.

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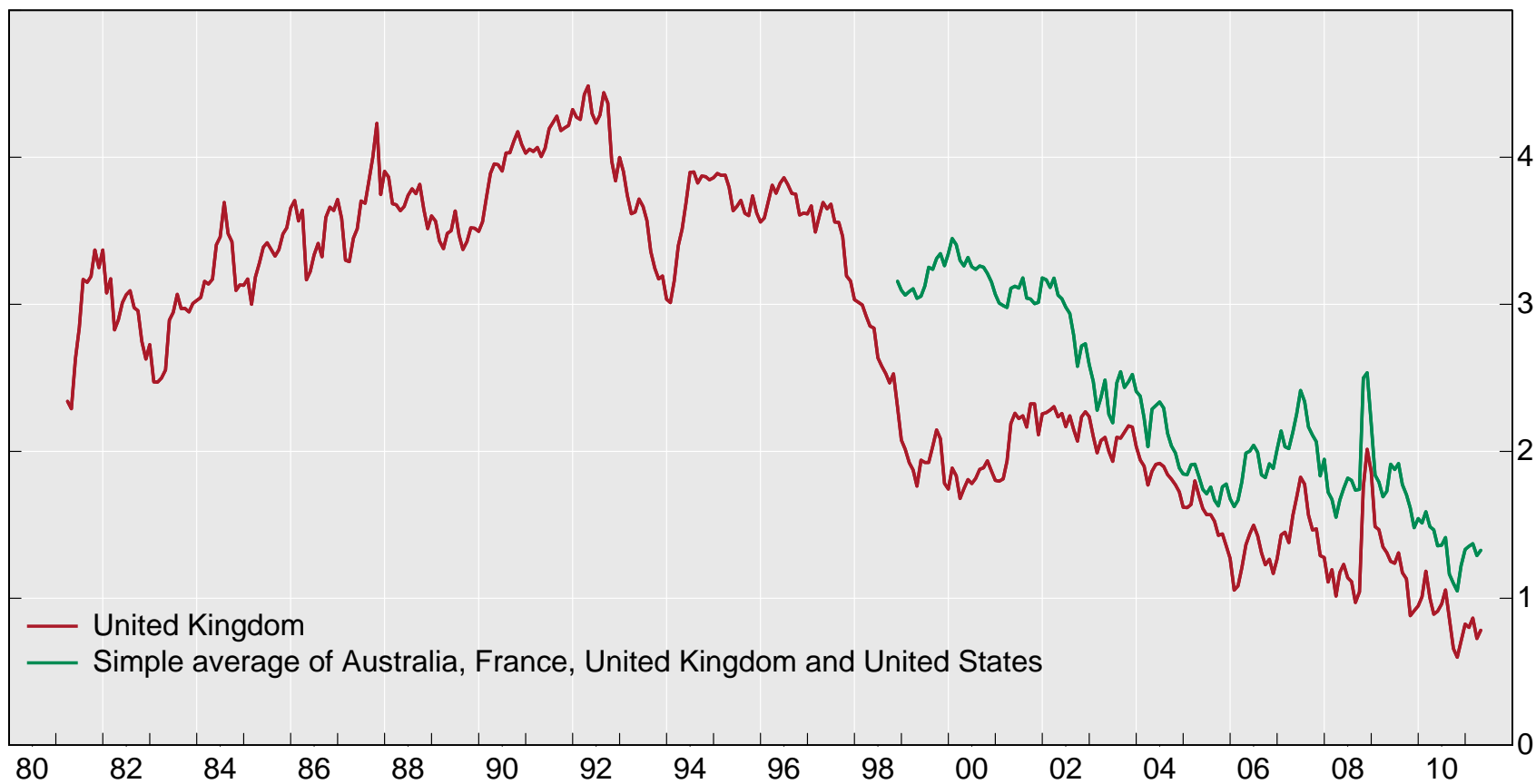
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Graphs and tables

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Graph 1
The real long-term interest rate¹
In per cent



¹ 10-year inflation-indexed yields; for Australia, 20-year; for the United Kingdom, constructed from long-term inflation-linked bonds issued since 1996.

Sources: National data; BIS calculations.

Graph 2
US real 5-year 5 years ahead yield
In per cent



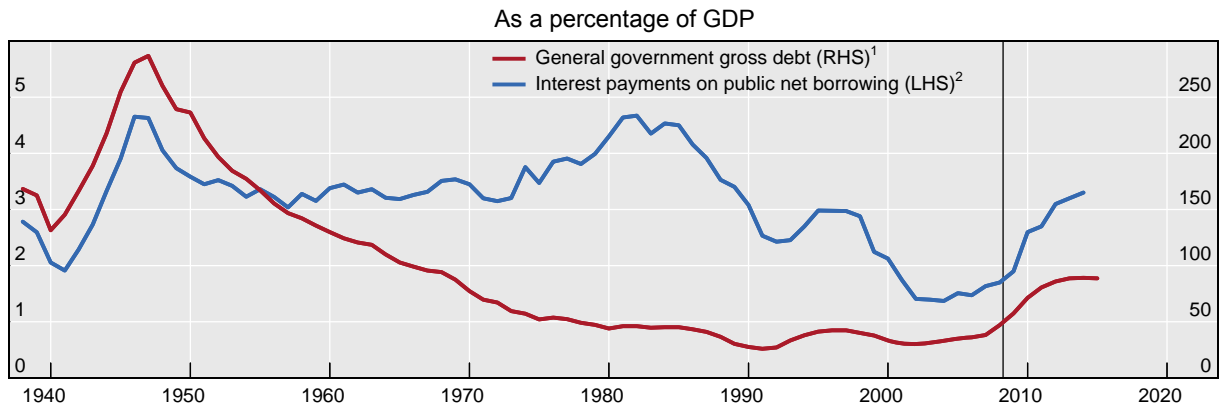
1 This is the implied 5-year rate starting five years hence; derived from the current 5-year and 10-year real rates on TIPS.

Sources: Bloomberg; BIS calculations.

Graph 3

Government debt and interest rates in the UK

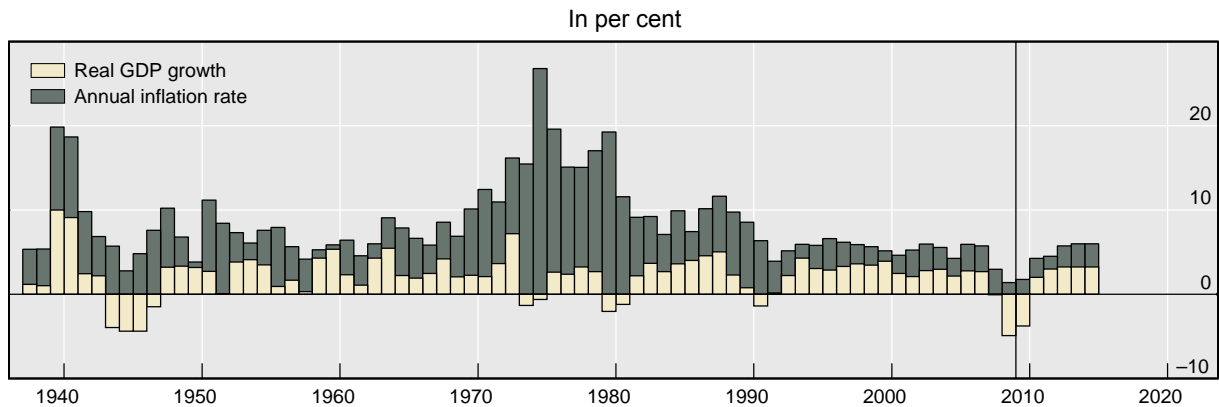
A. Fiscal indicators



¹ On a Maastricht treaty basis; March 2010 HMT Budget forecasts. ² March 2010 HMT Budget forecasts.

Sources: HM Treasury (HMT); B Mitchell, *British historical statistics*; Cambridge University Press; OECD; UK Office for National Statistics; *Economic Trends Annual Supplement*; national data.

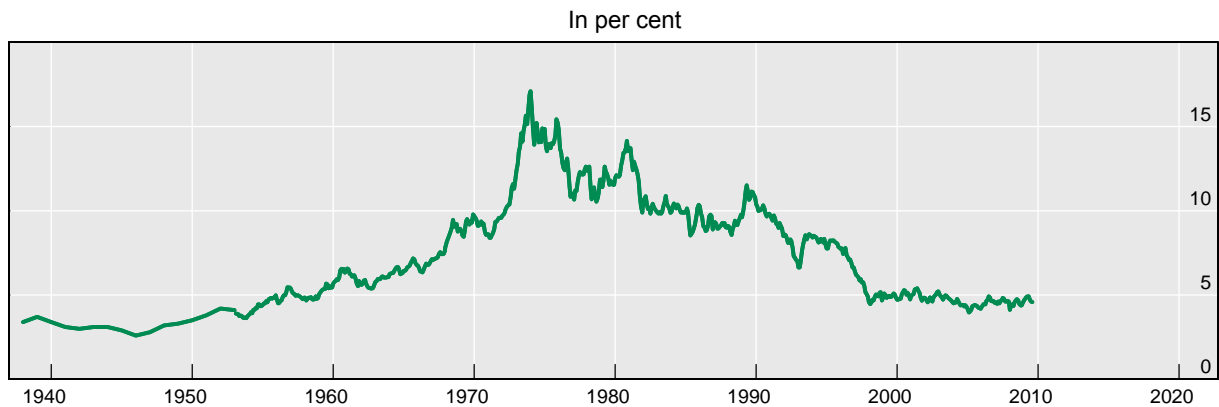
B. Nominal GDP growth¹



¹ After 2009, March 2010 HMT Budget forecasts.

Sources: HM Treasury (HMT); B Mitchell, *British historical statistics*; Cambridge University Press; UK Office for National Statistics; national data.

C. Gross interest yield on 2.5% consol



Source: B Mitchell, *British historical statistics*; *Economic Trends Annual Supplement*; Datastream.

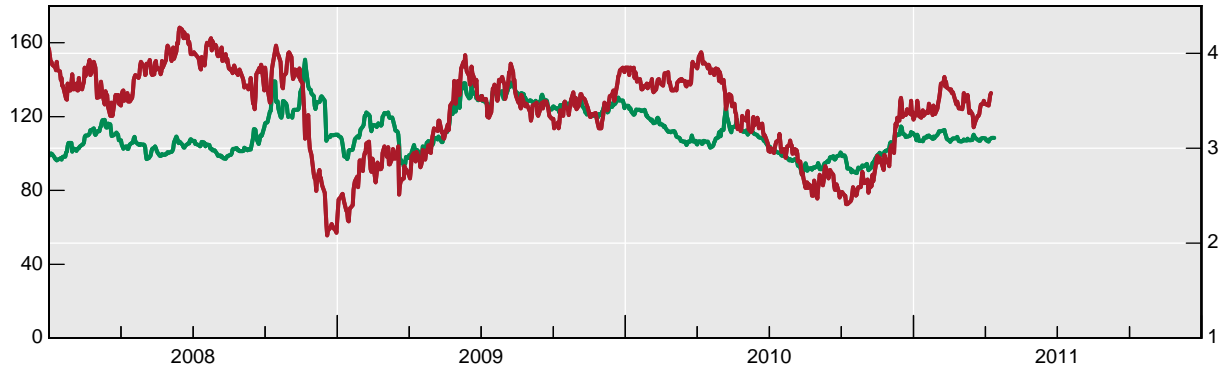
Graph 4

Bond yields and swaption-implied volatility

Japan: 2002 - 2005



United States: 2008 -



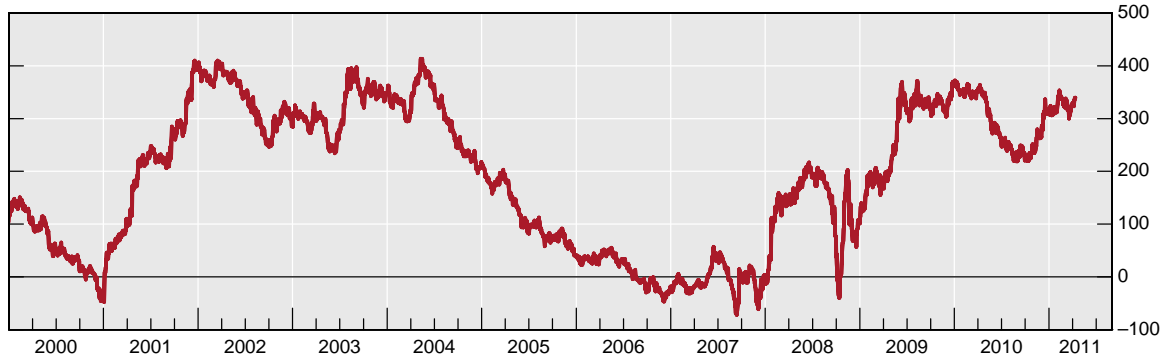
¹ Ten-year government bonds; in per cent. ² Implied swaptions, in annualised basis points.

Sources: Bloomberg (Deutsche Bank ticker DVX and DVXCJPY); national data.

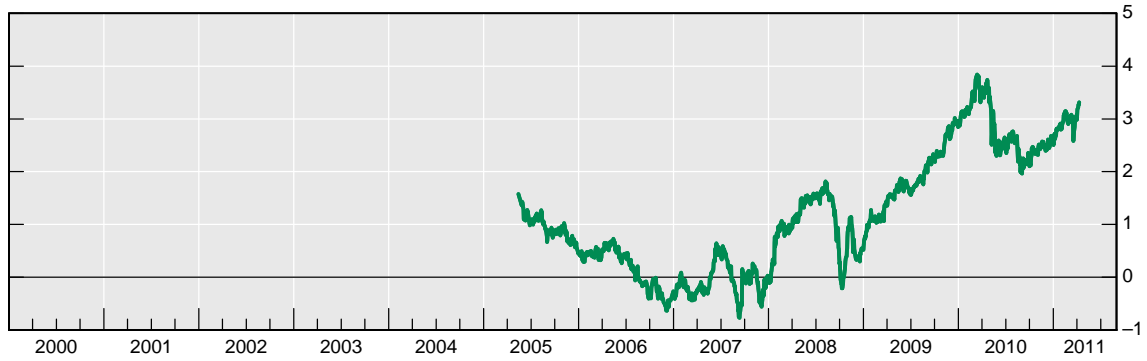
Graph 5

Dollar term spread and interest rate carry-to-risk ratio

Term spread¹



Carry-to-risk ratio²

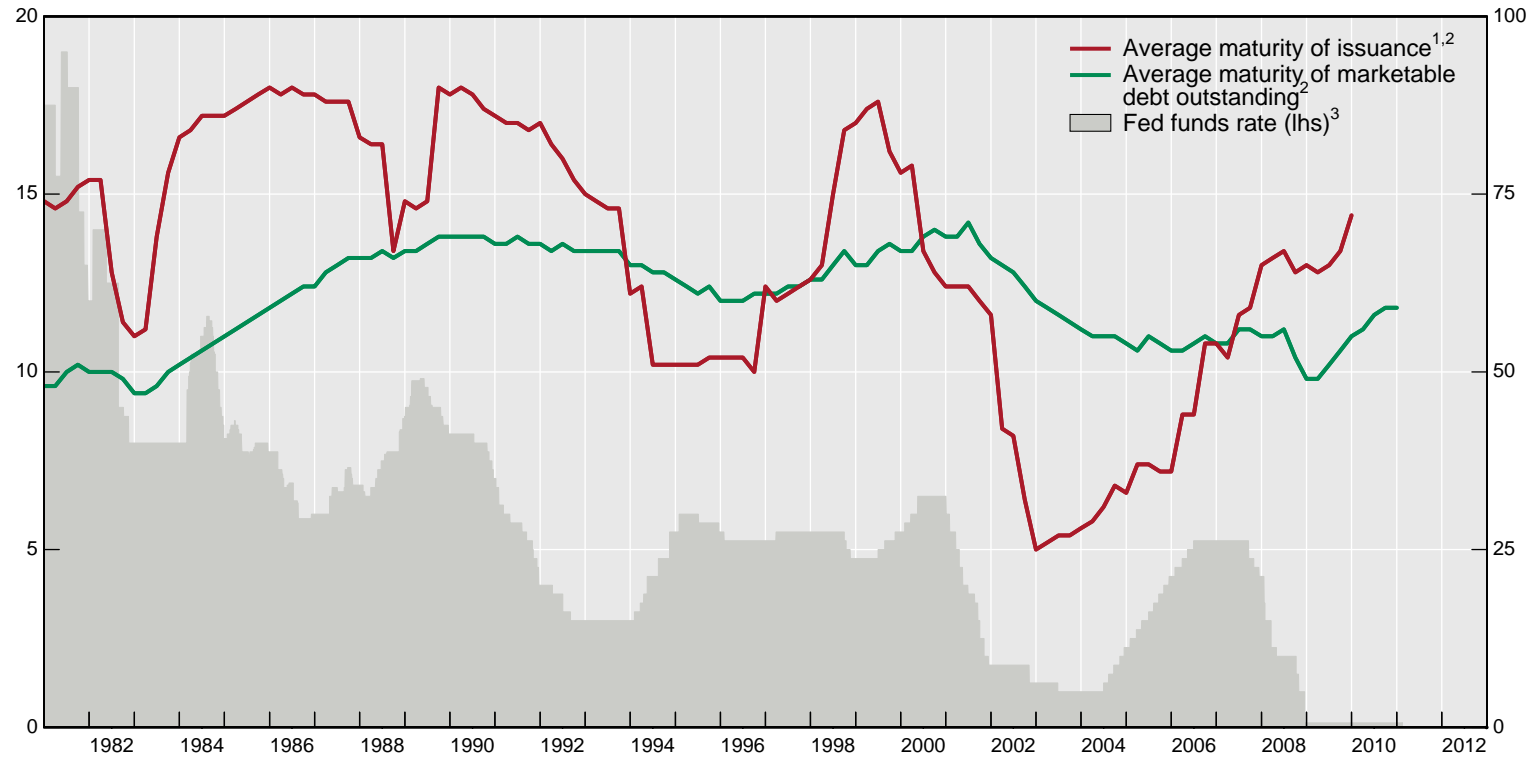


¹ Ten-year swap rate minus three-month money market rate, in basis points. ² Defined as the differential between 10-year swap rate and three-month money market rate divided by the three-month/10-year swaption implied volatility.

Sources: Bloomberg; BIS calculations.

Graph 6

Maturity of US government bonds



¹ One-year moving average; shown at the end. ² In months. ³ In per cent.

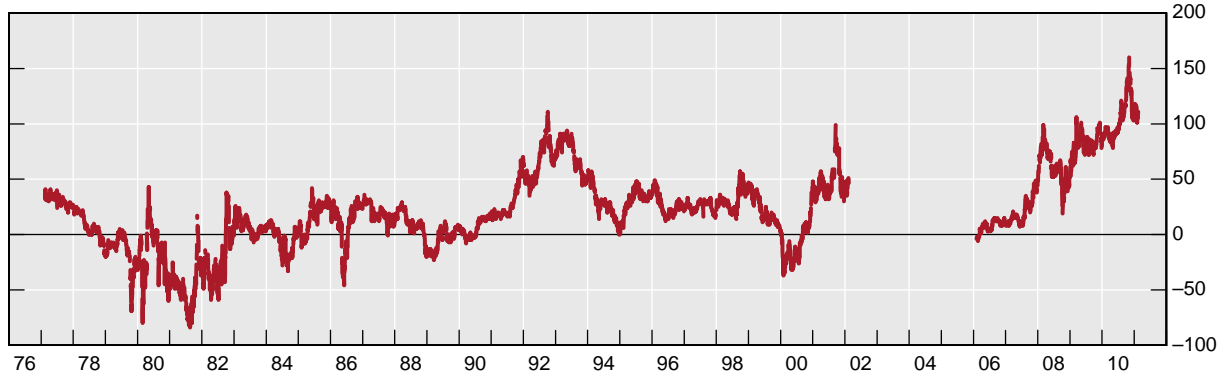
Source: Datastream; US Treasury.

Graph 7

30-year US Treasury bonds

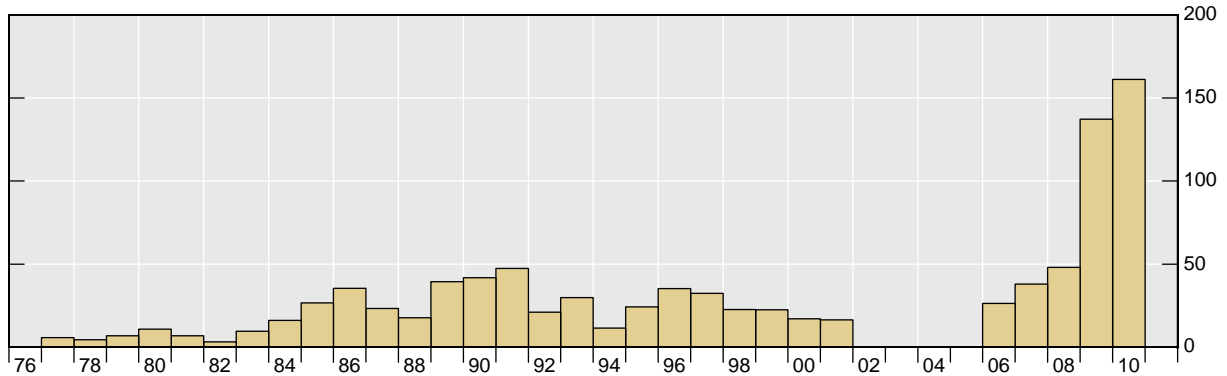
A. Spread over 10-year US Treasuries

In basis points



B. Issuance¹

In billions of US dollars



¹ Remaining maturity of about 30 years at end-December. Only marketable bonds issued between January and December of a particular year are used for that particular year's debt issuance calculation.

Sources: Treasury Direct; national data; BIS calculations.

Table 1
Debt securities outstanding¹
 In billions of US dollars

	Dec 89	Dec 99	Dec 06	Dec 09	Sep 10
Governments	7,201	14,401	25,445	36,356	40,303
United States	2,839	4,408	6,236	9,486	10,758
Japan	1,306	3,670	6,750	9,657	11,215
Germany	250	622	1,479	1,850	1,863
Other euro area	1,474	2,831	4,796	6,654	6,726
United Kingdom	226	473	841	1,239	1,434
Financial institutions	5,873	15,555	34,556	44,003	42,803
United States	2,656	7,979	16,013	17,464	16,410
Japan	928	1,662	1,079	1,204	1,337
Germany	482	1,531	2,399	2,649	2,436
Other euro area	959	1,903	7,621	12,017	11,774
United Kingdom	151	712	2,605	3,762	3,731

¹ Domestic plus international.

Note: The BIS endeavours to eliminate any overlap between its international and domestic debt securities statistics as far as possible. However, as two different collection systems are used (security by security collection system for IDS and collection of aggregated data for DDS) as well as two different approaches and definitions (market definitions for the IDS and statistical definitions in the DDS), some overlap and inconsistencies might remain by a margin which differs from country to country.

Source: Dealogic; Euroclear; Thomson Reuters; Xtrakter Ltd; national authorities; BIS.

Table 2
Debt securities, changes in stocks¹

In billions of US dollars

	2003– 2006 ²	2007	2008	2009	Dec 2009– Sep 2010 ³
Governments	1,772	1,195	2,651	4,175	3,778
remaining maturity < 1 year	346	-52	1,500	314	-191
longer remaining maturity	1,426	1,247	1,150	3,861	3,969
Financial institutions	3,069	4,973	2,645	434	-916
remaining maturity < 1 year	589	803	-37	-895	-624
longer remaining maturity	2,481	4,170	2,681	1,329	-292
World GDP	43,479	55,392	61,221	57,937	60,933

¹ Domestic plus international issues. Exchange rate adjusted. ² Annualised. ³ Cumulative.

Note: The BIS endeavours to eliminate any overlap between its international and domestic debt securities statistics as far as possible. However, as two different collection systems are used (security by security collection system for IDS and collection of aggregated data for DDS) as well as two different approaches and definitions (market definitions for the IDS and statistical definitions in the DDS), some overlap and inconsistencies might remain by a margin which differs from country to country.

Source: Dealogic; Euroclear; Thomson Reuters; Xtrakter Ltd; national authorities; IMF; BIS.

Table 3

Estimates of recent quantitative easing in the UK and US

	Impact on	
	Long-term rates	Exchange rate (or foreign impact)
<i>United States</i>		
Prakken (2010)		50 bp fall in 10-year bond yield lowers the dollar by 2%
Neely (2010)	US 10-year Treasury yields fell by a total of 107bp during the 5 Large-Scale Asset Purchase buy windows (\$1.75 trillion dollar total debt purchase)	Foreign 10-year government bond yields (Australia, Canada, Germany, Japan, UK) fell by a total of on average 53bp during the 5 Large-Scale Asset Purchase buy windows The US dollar exchange rate against the AUD, CAD, EUR, JPY, £ depreciated by a total of on average 6.6% during the 5 Large-Scale Asset Purchase buy windows
Gagnon et al (2010)	US Large-Scale Asset Purchases (\$1.75 trillion dollar total debt purchase) lowered 10-year Treasury yield by 90 bp	
D'Amico and King (2010)	US purchase of \$300 billion of US Treasury coupon securities lowered 10 to 15 Treasury yields by up to 50bp	
Meyer and Bomfim (2010)	Fed communication about Large-Scale Asset Purchases (\$1.75 trillion dollar total debt purchase) reduced 10-year Treasury yield by 50 to 60 bp	
<i>United Kingdom</i>		
Meier (2009)	£125 billion purchases reduce longer-term gilt yields by between 40 and 100 bp	
Joyce et al (2010)	Total impact of £200 billion of purchases (most of which gilts) lowered long-term gilt yields on average by 100 bp, with reactions ranging between 55 and 120 bp across the 5-25 year segment of the yield curve	Sterling ERI depreciated by 4%

Table 4
Composition of marketable US Federal government debt held by the public
 \$ billion

End of fiscal year (Sept)	Marketable securities		Currency & Federal Reserve obligations	Total	Money, Federal Reserve obligations and short-term debt
	(<or = 1 year)	(> 1 year)			
	(a)	(b)	(c)	(d)	= (a+c) % d
1955	43	113	51	207	45%
1969	80	82	73	235	65%
1990	527	1668	306	2501	33.3%
2001	735	2180	638	3553	38.6%
2007	955	3474	834	5263	34%
2008	1484	3726	1087	6297	40.8%
2009	1986	5002	1780	8768	42.9%
2010 ¹	1784	6692	1943	10419	35.8%

¹ Using Monthly Statement of the Public Debt of the United States; Federal Reserve Table H.4.1.

Sources: This is an update of that in Tobin (1963) using US Treasury Bulletin; Federal Reserve Flow-of-Funds.

Table 5
US Treasury securities held by the public
 \$ billion

	Total	Bills	Bonds²	Memorandum: average maturity
2009¹				
June	6592	2000	4592	3 years 11 months
August	6918	2062	4856	4 years 0 months
December	7250	1788	5462	4 years 4 months
2010				
June	8079	1777	6302	4 years 7 months
September	8476	1784	6692	4 years 9 months
December	8841	1769	7072	4 years 9 months

¹ End of month. ² Notes, bonds and TIPS.

Sources: *US Treasury Bulletin*.