

BANK FOR INTERNATIONAL SETTLEMENTS

Fiscal sustainability, long-term interest rates and debt management

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The opinions presented here are those of the author and do not necessarily reflect those of the Bank for International Settlements



Introduction

- Public debt is at a peacetime record and still rising
- Despite significant fiscal consolidation, fiscal positions are still unsustainable in many advanced economies
- Low borrowing costs unlikely to persist



Introduction

- Long-term rates are influenced by debt maturity
- Sales of bonds by central banks could therefore raise term premia and hence sovereign financing costs...
- ... complicating exit from very accommodative monetary policy



Outline

- Debt and fiscal sustainability: how serious is the problem?
- Interest rate effects of debt and its maturity (US evidence)
- Implications for fiscal sustainability and exit from accommodative monetary policy





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Fiscal sustainability

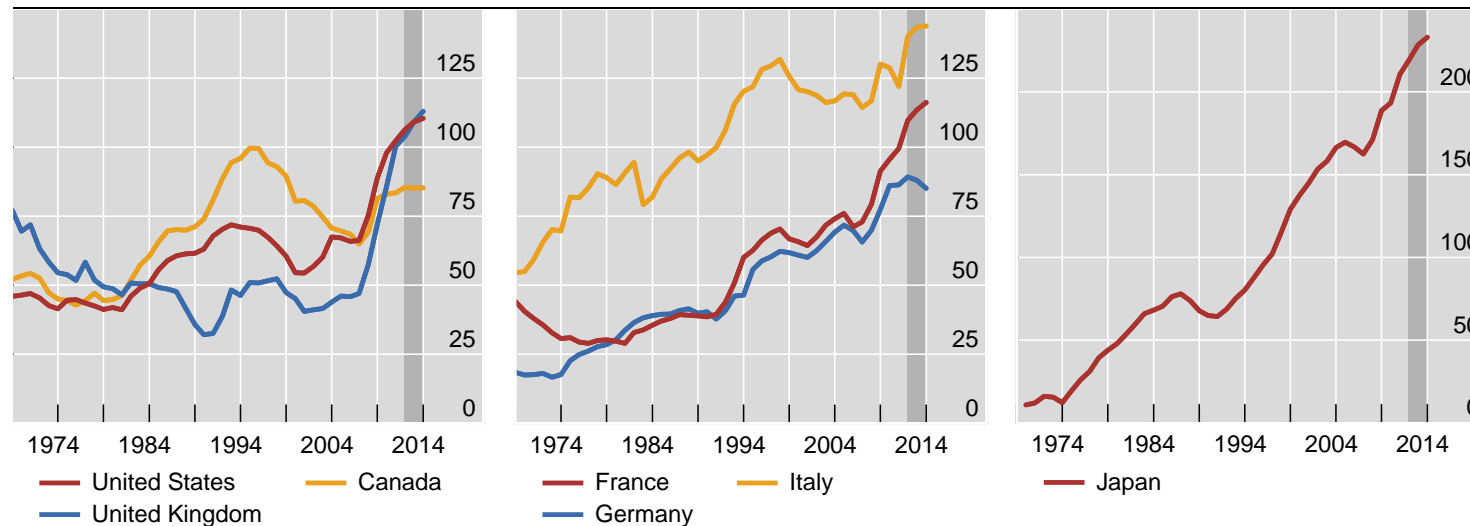


Public debt has been trending up since mid-70s

General government gross debt¹

As a percentage of GDP

GraphNumber



¹ 2013–14 data are estimates and projections.

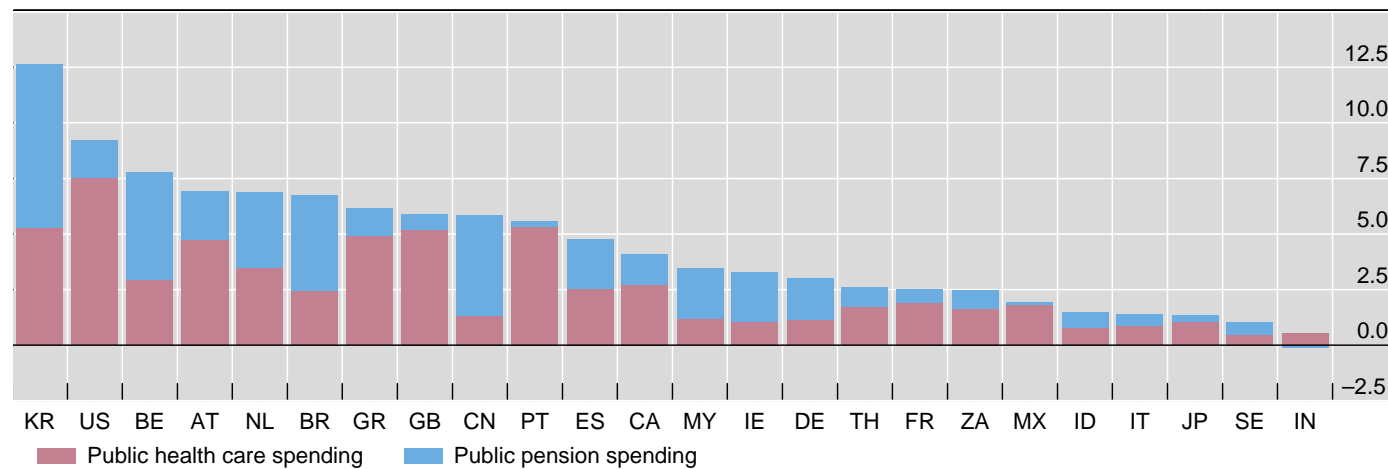
Source: OECD, *Economic Outlook*, May 2013.

- Debt problem predates the crisis: except Canada and UK, most advanced economies had a deficit bias
- Official debt figures understate the true size of fiscal problems

Public pension and health care spending set to rise

Projected changes in age-related spending, 2013–40¹

In percentage points of potential GDP



AT = Austria; BE = Belgium; BR = Brazil; CA = Canada; CN = China; DE = Germany; ES = Spain; FR = France; GB = United Kingdom; GR = Greece; ID = Indonesia; IE = Ireland; IN = India; IT = Italy; JP = Japan; KR = Korea; MX = Mexico; MY = Malaysia; NL = Netherlands; PT = Portugal; SE = Sweden; TH = Thailand; US = United States; ZA = South Africa.

- Without reforms, age-related spending will put enormous strain on public finances in several countries, including EMEs



High debt is a clear vulnerability

- Higher debt brings the economy closer to its fiscal limits (eg Bi & Leeper (2013); Leeper (2013))
- Hence:
 - For a given shock, the probability of inflationary finance or outright default rises with debt (in a non-linear fashion)
 - Less room for countercyclical policy (or lending during financial crisis) – higher macro volatility and uncertainty
 - Self-fulfilling debt–interest rate spirals more likely



High debt is likely to be a drag on growth

- Even if no shock leads to default or inflation, persistently high debt is likely to be costly:
 - Investors demand higher risk premia
 - Uncertainty could depress spending by firms and households
 - Uncertainty about the solidity of banks could restrict credit supply
- Higher debt means higher interest payments – hence higher distortionary taxes:
 - Effects of taxes on growth could be non-linear (Jaimovich & Rebelo, 2012)



Evidence on debt and growth

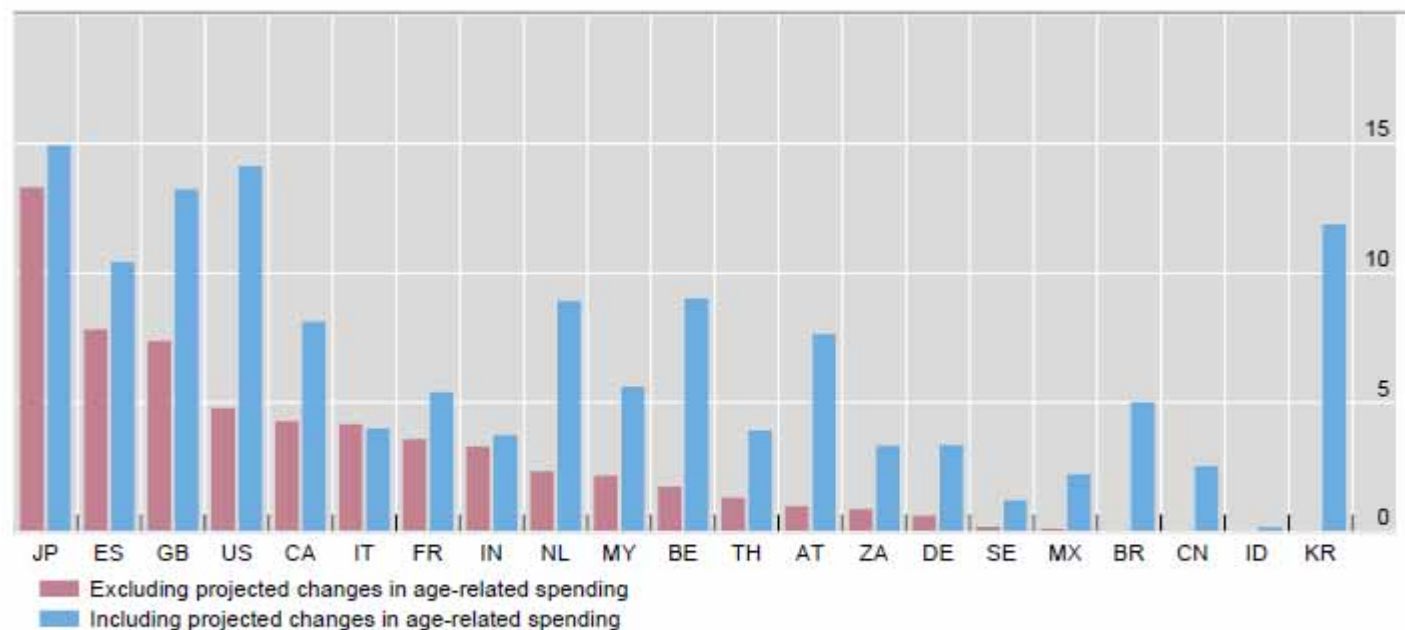
Multivariate studies on the effects of debt on growth				
Study	Sample	Threshold	Effect of 10 pp rise in the debt-to-GDP ratio	
Kumar and Woo (2010)	38 advanced and emerging market economies, 1970–2007	90%	–0.17 pp	
Caner, Grennes and Koehler-Geib (2010)	79 advanced and developing economies, 1980–2008	77%	–0.17 pp	
Cecchetti, Mohanty and Zampolli (2011)	18 OECD economies, 1980–2006	84%	–0.13 pp	
Baum, Checherita-Westphal and Rother (2012)	12 euro area economies, 1990–2010	96%	–0.59 pp	

- Multivariate evidence builds on empirical growth literature
- More research is needed to clarify causality, thresholds, etc. However, theoretical reasons and evidence to date suggest a risk to trend real growth when debt is persistently above the estimated threshold
- Stabilising debt not a free lunch. Better to aim at a reduction in the long run



Some estimates of fiscal adjustment needs¹

Growth-adjusted interest rate² = 2013 level



AT = Austria; BE = Belgium; BR = Brazil; CA = Canada; CN = China; DE = Germany; ES = Spain; FR = France; GB = United Kingdom; ID = Indonesia; IN = India; IT = Italy; JP = Japan; KR = Korea; MX = Mexico; MY = Malaysia; NL = Netherlands; SE = Sweden; TH = Thailand; US = United States; ZA = South Africa.

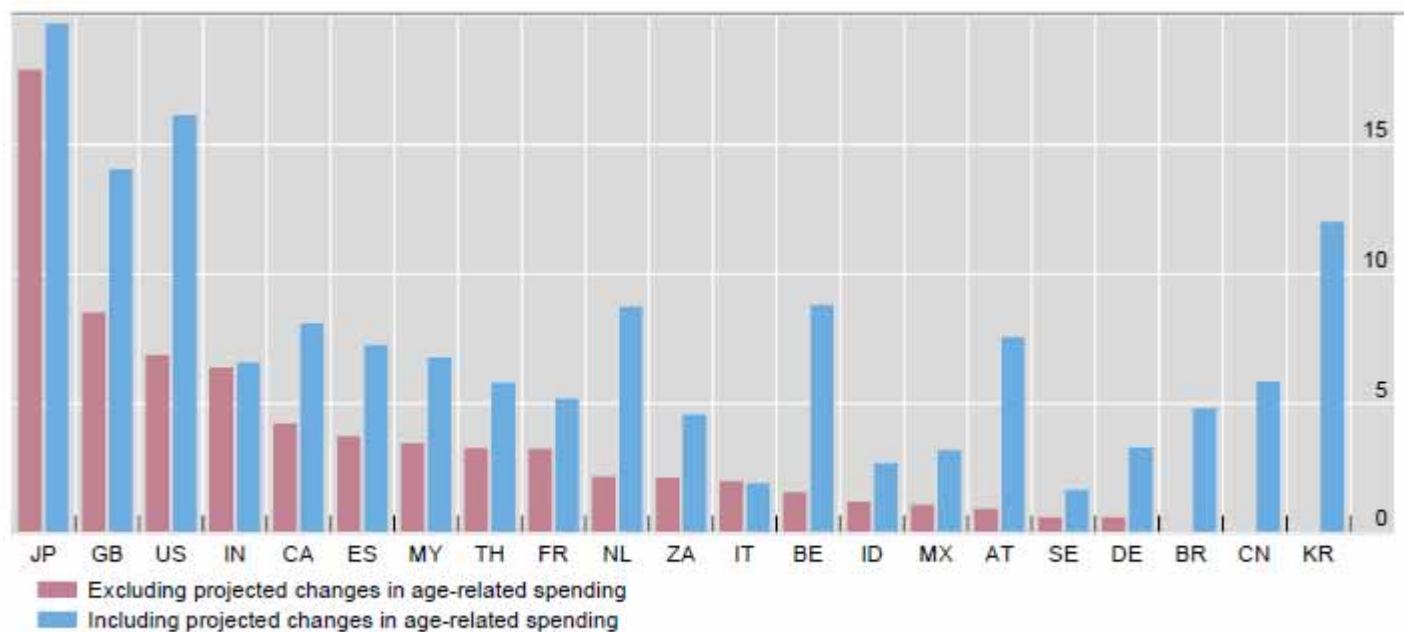
¹ Adjustment in the underlying primary balance in percentage points of potential GDP (defined as the difference between the peak in the underlying primary balance during 2014–40 and its initial projected 2013 level) needed to bring the gross debt-to-GDP ratio to 60% for advanced economies (200% for Japan) and 40% for emerging market economies by 2040. ² Defined as $(1 + r) / (1 + g)$, where r = nominal effective interest rate and g = nominal GDP growth. The nominal effective interest rate in each year is defined as the government interest expense for that year divided by the stock of government debt at the end of the previous year.

Sources: IMF; OECD; author's calculations.



Some estimates of fiscal adjustment needs¹

Growth-adjusted interest rate² = 2013 level converging to 1% over 5 years



AT = Austria; BE = Belgium; BR = Brazil; CA = Canada; CN = China; DE = Germany; ES = Spain; FR = France; GB = United Kingdom; ID = Indonesia; IN = India; IT = Italy; JP = Japan; KR = Korea; MX = Mexico; MY = Malaysia; NL = Netherlands; SE = Sweden; TH = Thailand; US = United States; ZA = South Africa.

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The interest rate effects of debt maturity

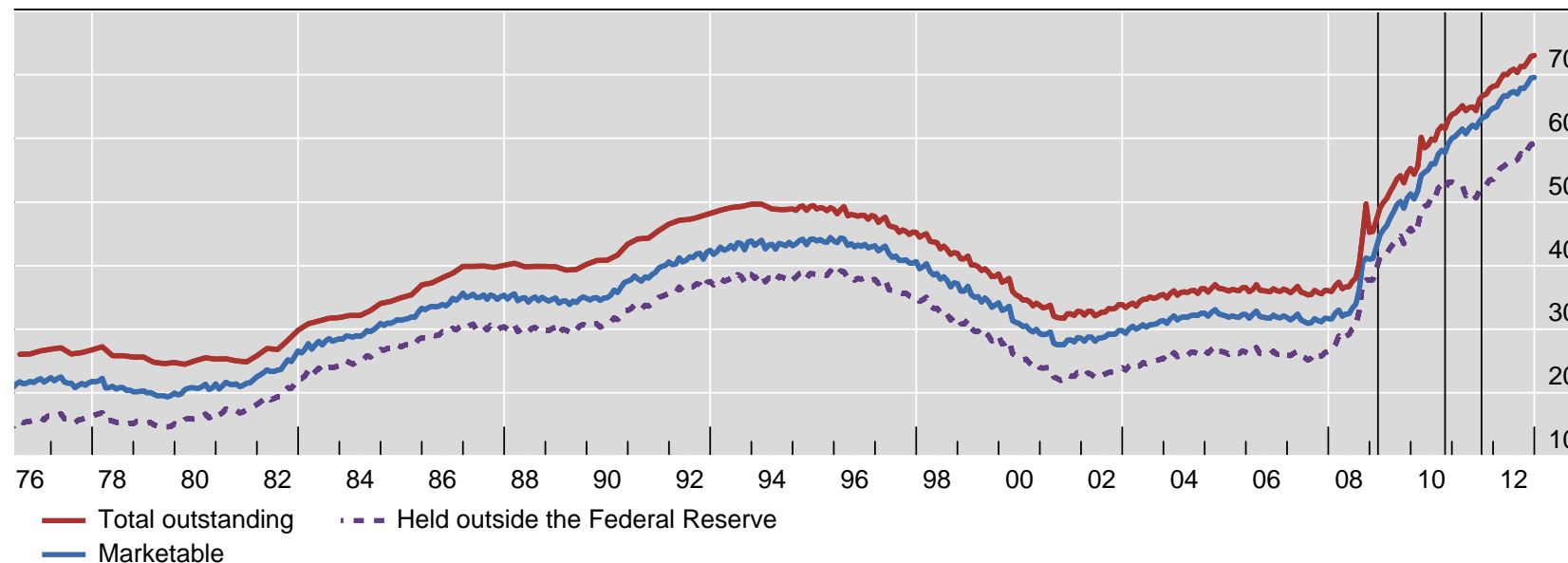


US federal debt

Treasury debt and Federal Reserve holdings (% of GDP)

Holders of US public debt

Graph 1



The vertical lines correspond to March 2009 (LSAP1), November 2010 (LSAP2) and September 2011 (MEP).

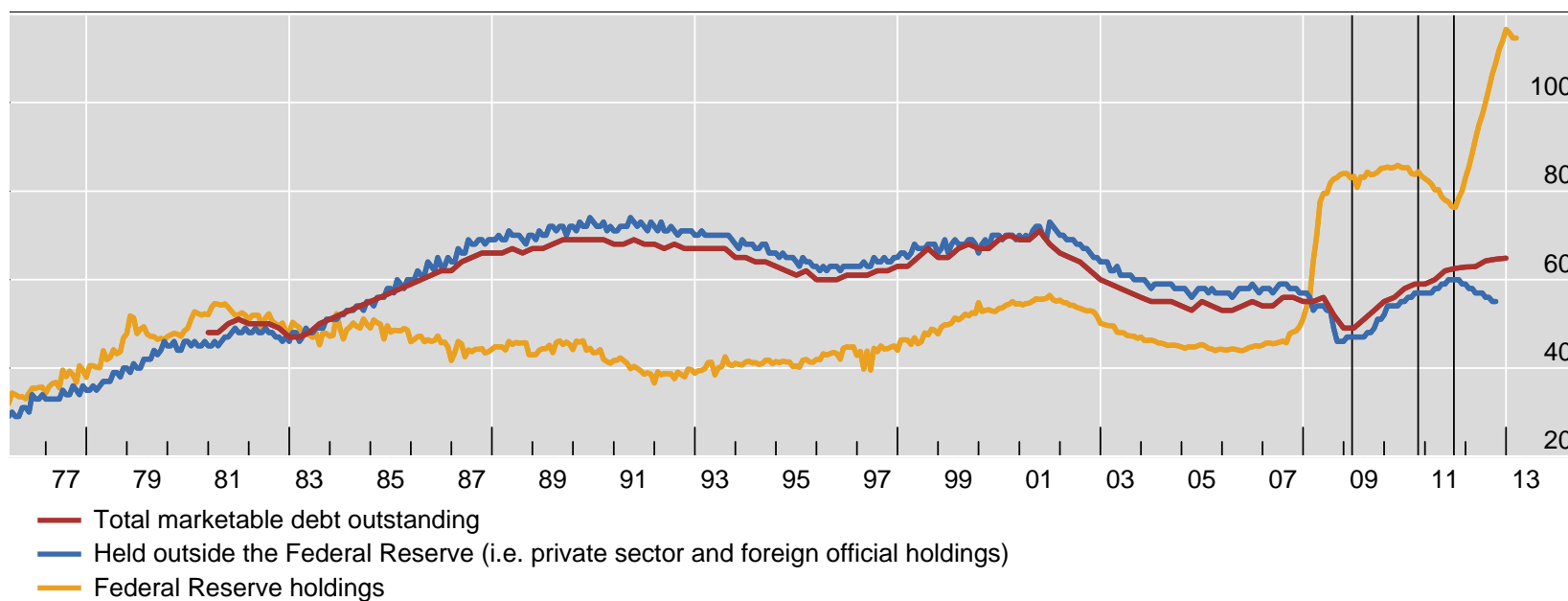
Sources: Datastream; national data; BIS calculations.

Average maturity of US federal debt

Average maturity of outstanding Treasury debt

In months

Graph 3



The vertical lines correspond to March 2009 (LSAP1), November 2010 (LSAP2) and September 2011 (MEP).

Sources: US Treasury; BIS calculations.

Interest rate effects of debt and its maturity (1)

- Relative supply of assets do not matter in the New Keynesian model
- Preferred-habitat theory and limits to arbitrage (Vayanos & Vila, 2009)
- Increase in maturity generally raise all rates, the longer by more (Greenwood & Vayanos, 2010)
- Chadha, Turner and Zampolli (2013) (forthcoming)
 - Simple empirical model building on Laubach (2009)
 - 5 year forward 10 year US rates are regressed on
 - 5-year ahead CBO projected debt and deficits
 - Sample is semi-annual data, 1976-2007
 - Controls for trend growth and risk aversion (dividend yield)



Interest rate effects of debt and its maturity (2)

- We add:
 - Average maturity of debt held outside the Federal Reserve
 - Other controls (capital inflows, Fed balance sheet, etc)
 - Allow for structural breaks
- We cross-check the results using 10-year term premium
- Pre-crisis period should help identify average effect not contaminated by special (possibly temporary) factors (eg regulatory changes, ...)



Five-year forward 10-year rate

Table 1

Variables	1976H1-2008H1					1986H1-2008H1	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Inflation expectation	1.048*** (0.070)	0.999*** (0.068)	1.029*** (0.082)	1.138*** (0.156)	1.006*** (0.132)	1.018*** (0.074)	0.942*** (0.087)
5-year ahead debt	0.017*** (0.006)	0.021*** (0.005)	0.017** (0.007)	0.015 (0.010)	0.018** (0.008)	0.021*** (0.005)	0.017** (0.008)
Average maturity	0.121*** (0.013)	0.129*** (0.012)	0.120*** (0.012)	0.132*** (0.015)	0.111*** (0.010)	0.118*** (0.016)	0.116*** (0.017)
Tbill volatility (t<86H2)	2.997*** (0.250)	2.973*** (0.257)	2.296*** (0.442)				
Dividend yield (t<86H2)	-0.934*** (0.247)	-0.802*** (0.290)					
Trend growth (t<86H2)	-0.862*** (0.289)						
Trend growth					-0.231 (0.280)		-0.140 (0.250)
Dividend yield					-0.019 (0.114)		0.110 (0.091)
Tbill volatility					2.232*** (0.450)		0.601 (0.856)
Observations	56	56	56	56	56	45	45
Adj R2	0.958	0.955	0.948	0.916	0.945	0.910	0.906

Notes: Newey-West standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. (t<86H2) indicates that a variable is multiplied by a dummy that takes the value of one before 1986H2 and zero thereafter. The regression includes a break dummy (t>=86H2).



Table 2: Five-year forward 10-year rate, business cycle, Fed holdings and official inflows

VARIABLES	(1) fw514	(2) fw514	(3) fw514	(4) fw514	(5) fw514	(6) fw514	(7) fw514
Inflation expectation	0.999*** (0.068)	0.942*** (0.094)	1.007*** (0.074)	1.117*** (0.128)	0.778*** (0.279)	0.972*** (0.068)	1.139*** (0.190)
Five-year ahead debt	0.021*** (0.005)	0.023*** (0.005)	0.028*** (0.006)	0.024*** (0.005)	0.019 (0.012)	0.019*** (0.005)	0.036*** (0.012)
Average maturity	0.129*** (0.012)	0.126*** (0.012)	0.124*** (0.014)	0.143*** (0.019)		0.138*** (0.017)	
Dividend yield (t<86H2)	-0.802*** (0.290)	-0.834*** (0.275)	-0.961*** (0.239)	-0.828*** (0.276)	-0.312 (0.621)	-1.192*** (0.187)	-1.465*** (0.344)
Tbill volatility (t<86H2)	2.973*** (0.257)	2.869*** (0.329)	3.125*** (0.231)	2.914*** (0.263)	3.174*** (0.622)	3.113*** (0.284)	3.367*** (0.840)
Three-month bill rate		0.036 (0.055)					
Real-time output gap			0.049 (0.035)				
Fed holdings of Treasuries				0.304 (0.289)	-0.968** (0.391)		
Official inflows into Treasuries						0.327 (0.198)	-0.522* (0.269)
Observations	56	56	53	56	56	53	53
Adj R2	0.955	0.955	0.952	0.956	0.892	0.960	0.901

Notes: Newey-West standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. (t<86H2) indicates that a variable is multiplied by a dummy variable that takes the value of one before 1986H2 and zero thereafter. The regression includes a break dummy (t>=86H2).

10-year term premium 1990H1 - 2008H1

Table 3

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Inflation expectation	0.148 (0.346)	0.139 (0.303)	0.524** (0.235)	0.024 (0.315)	0.063 (0.225)	0.426** (0.200)
Five-year ahead debt	0.012 (0.008)	0.011 (0.007)	0.010 (0.007)			
Average maturity	0.115*** (0.026)	0.117*** (0.023)	0.096*** (0.020)	0.126*** (0.024)	0.127*** (0.020)	0.106*** (0.019)
Trend growth	0.028 (0.264)			-0.064 (0.224)		
Dividend yield	0.212 (0.133)	0.220** (0.102)		0.232* (0.121)	0.213** (0.093)	
Tbill volatility	0.418 (0.761)			0.407 (0.716)		
Five-year ahead deficit				0.093** (0.034)	0.092*** (0.033)	0.090** (0.041)
Observations	37	37	37	37	37	37
Adj R2	0.834	0.843	0.835	0.844	0.853	0.844

Notes: Newey-West standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.



Effects of QE

Table 4: Potential effects of central bank purchases of Treasuries since November 2008

	Change	5y forward 10y rate		10y term premium	
		Marginal effect (range)	Total effect (range)	Marginal effect (range)	Total effect (range)
Privately-held debt (% of GDP)	7	1.7 2.1	12 15	0 1.2	0 8
Average maturity (months)	7	11.6 14.3	81 100	9.6 12.7	67 89
Total effect (bps)			93 115		67 97

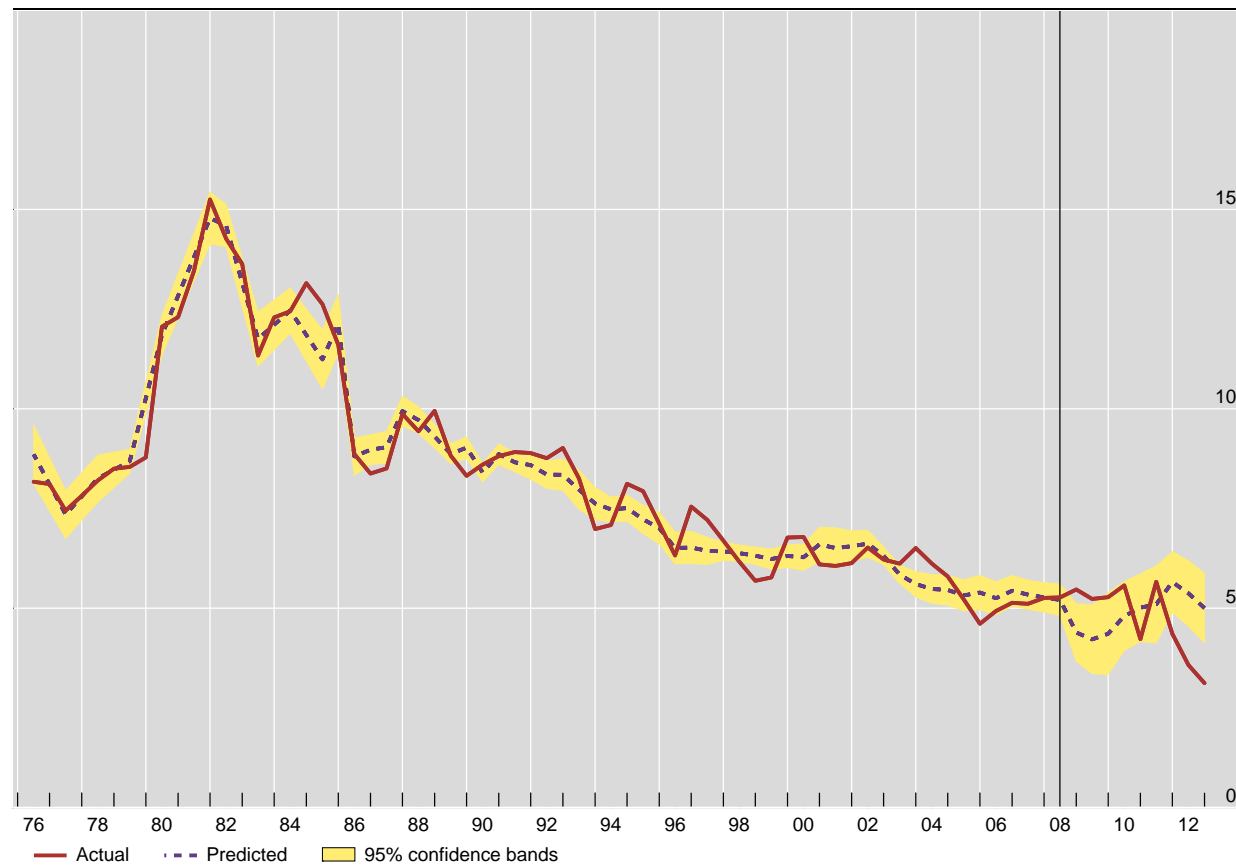
Notes: Change in the first column refers to changes in privately-held debt which could be attributed to central bank interventions since November 2008. The range is selected by taking the min and max estimated coefficients in Table 1-2 (forward rate) and Table 3 (term premium).

Are interest rates likely to rise?

Five-year forward 10-year rate: actual and predicted values¹

In per cent

Graph 4

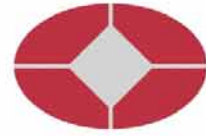


¹ Predicted values are from a regression of the 5-year forward 10-year rate on average maturity of federal debt held outside the Federal Reserve and other regressors. Value to the right of the vertical line are out-of-sample predictions.

To sum up

- Interest rate effects of maturity are found to be large
 - One year increase in maturity is associated with about 130-150 basis points increase in the 5-year forward 10-year rate
 - Similar estimates for the nominal 10-year term premium
- Are the estimates biased?
 - If debt managers increase maturity when long-term rates are expected to increase, then:
 - Shock to long-term rates can be amplified
 - Estimates could be biased upward
 - Even so, to the extent that debt managers behave as they did in the past, estimates allow to predict effects of maturity on rates





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Implications



Long-term interest rates likely to rise

- Long-term interest rates are significantly below where they should be based on average historical effect
- Special factors (regulation, accounting, safe-heaven flows, etc.) may fade
- Expectations may change rapidly
- Sales of bonds by the central banks can raise long-term rates even further (through maturity effects)
- Estimates suggest that the latter effects could be large

Exit from accommodative policy

- Exit can be constrained by:
 - Need to keep sovereign borrowing costs low
 - Exposure of interest rate risk in the financial sector
- Should debt management be separated from central bank?
- Can monetary policy rely only on the short-term interest rate? (“Old Keynes”; Radcliffe Report, 1959)

Higher interest rates would worsen debt dynamics

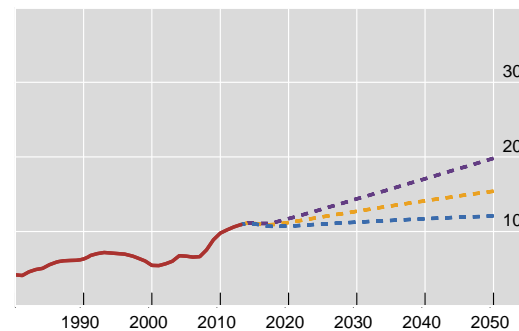
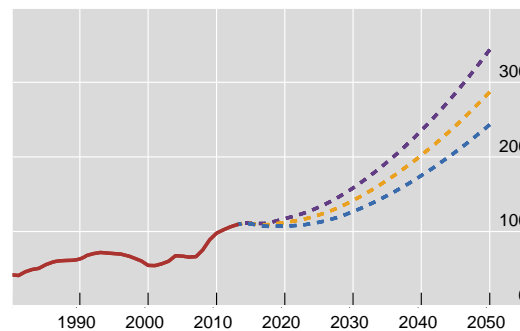
General government debt projections under alternative scenarios

As a percentage of GDP

Incorporating projected increases in age-related spending

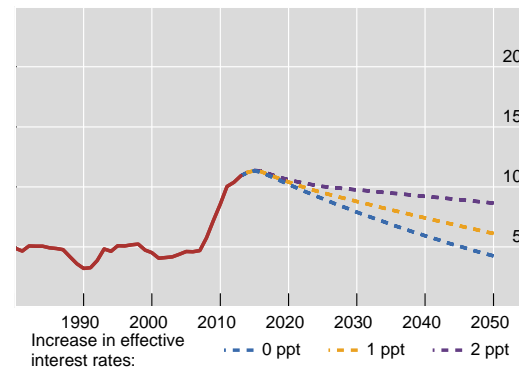
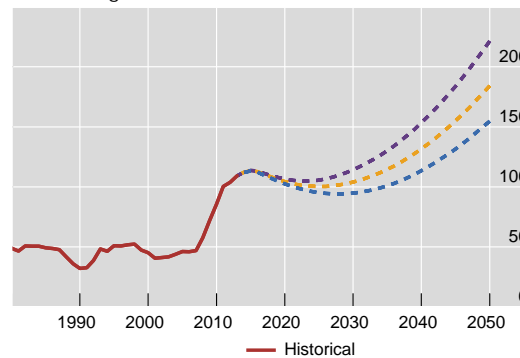
Keeping age-related spending as a share of GDP constant

United States



Japan

United Kingdom

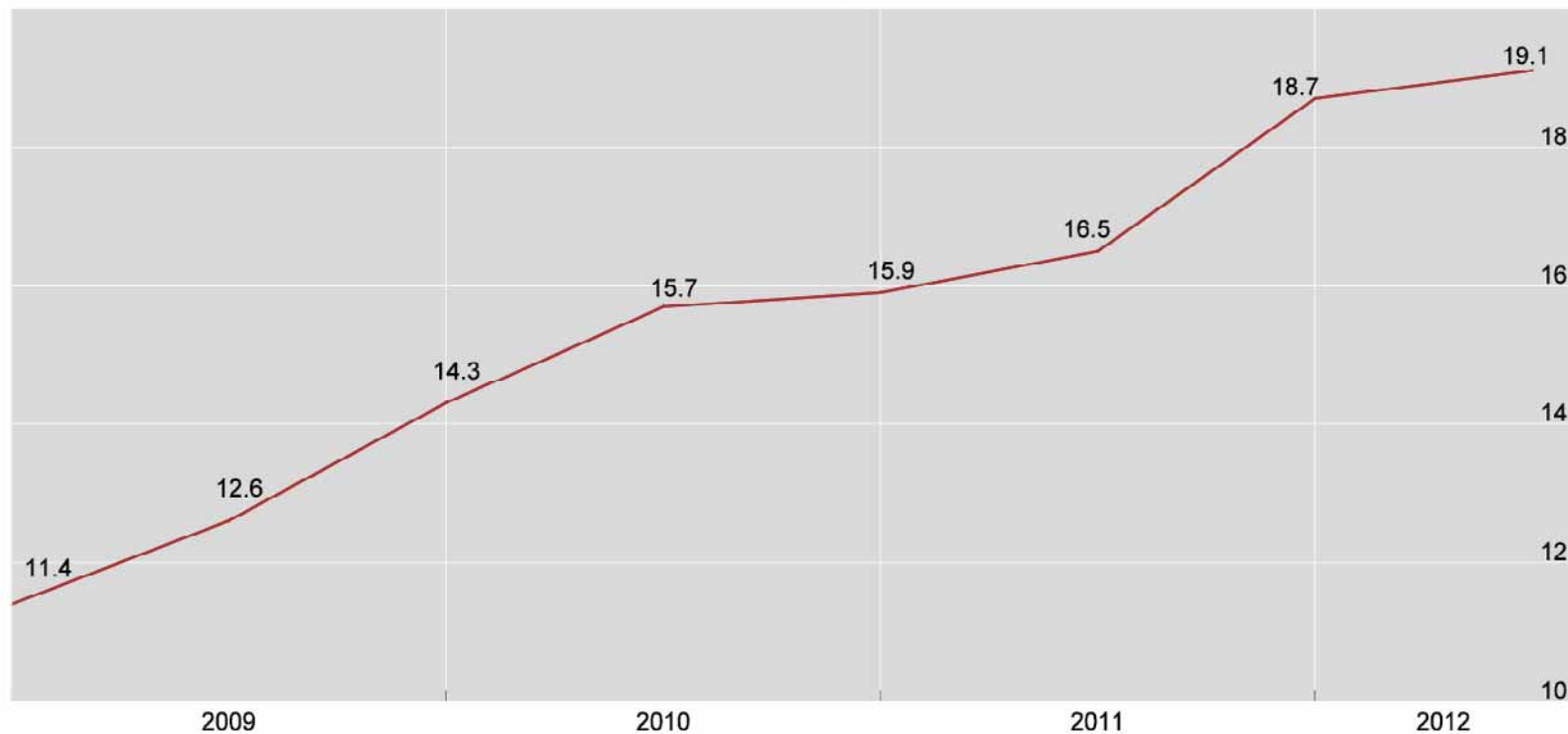


Increase in effective interest rates: 0 ppt 1 ppt 2 ppt



How large and concentrated is interest rate risk exposure?

Graph 7
Share of sovereign exposures in total banking book exposures
In per cent



Notes:

(1) These data are based on a consistent sample of 30 large banks (i.e. those that are internationally active and have Tier 1 capital in excess of €3 billion).

(2) Exposures are post credit risk mitigation and after applying credit conversion factors where applicable. Sovereign exposures as defined in paragraph 229 of the Basel II framework.

Source: Basel Committee on Banking Supervision.



Conclusion

- Evidence suggests that interest rate effects of changing the maturity structure of public debt could be sizeable
- Exit from very accommodative monetary policy would raise average maturity of debt held by the market and hence term premia.
- Higher borrowing costs for governments and unsustainable fiscal positions of major advanced economies would complicate monetary policy decisions in the years ahead.