GDP-linked bonds and Debt distribution: Theoretical benefits and Practical limits

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Outline

Introduction

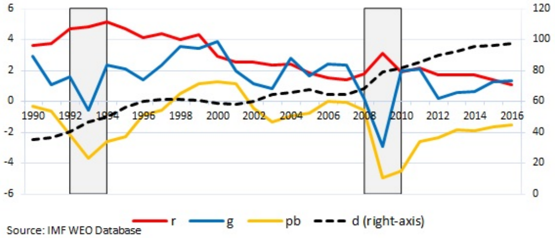
- As a consequence of the financial crisis, advanced economies are currently faced with high debt-to-GDP ratios
- In most advanced economies, fiscal and monetary policies are constrained by institutional arrangements or the zero-lower bound
- Growth-indexed bonds (defined here as bond with fixed principal and time-varying coupon) can provide benefits, but need to be realistic about benefits and weigh them against potential costs

Motivation

- During recessions, interest rate tend to go up while the primary balance deteriorates, leading to an important increase in debt ratio

France (1990 - 2016)

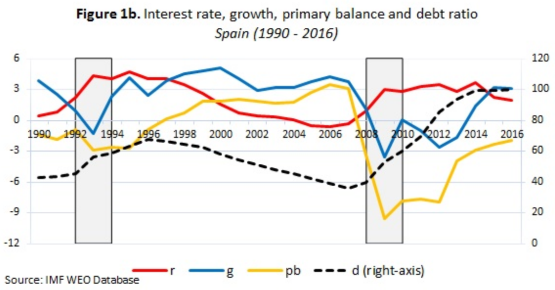
Figure 1a. Interest rate, growth, primary balance and debt ratio
France (1990 - 2016)



Motivation (bis)

- During recessions, interest rate tend to go up while the primary balance deteriorates, leading to an important increase in debt ratio

Spain (1990 - 2016)



A brief literature review

- The proposal to index sovereign debt repayments to macroeconomic variables has recently regained interest
- First Shiller (1993), then Borensztein and Mauro (2004), and more recently Barr et al. (2014), Benford et al. (2016), Blanchard et al. (2016) and IMF (2017)
- Two main arguments:
  - Ability to implement counter-cyclical fiscal policy
  - Reduced debt distribution and lower probability of default

This paper

- Extends the literature by deriving the debt stabilization benefits from different types of indexed bonds
- Shows that the potential benefits from indexation depend on four main factors:

  - The joint distribution of growth rates, interest rates, primary surpluses, and the variables included in the indexation formula

  - The relation of the primary surplus to the variables included in the indexation formula, which impacts the 'optimal degree of indexing'

  - The premium demanded by investors for the different types of indexed bonds

  - The ratio of indexed debt to total public debt

Main results: An interesting idea, but ...

- Growth-indexed bonds can bring relevant benefits to some countries, but do not protect the sovereign against shocks to the primary balance
- Alternative indexation formulas could achieve a higher reduction in the debt distribution, but small additional gains may not justify such complex indexation schemes
- The size of the potential premium is crucial: premium of 100bps may cancel potential benefits
- The share of indexed debt matters: 20% of indexed debt may only provide limited benefits

Debt distribution

- Two factors: The expected path of the debt-to-GDP ratio and the distribution around it
- Debt indexation provides benefits in terms of reduction in the upper tail of the distribution, but may come at the cost of a higher expected path
- As a first step, we ignore the impact of a potential premium and focus only on the debt distribution around its expected path
- We shall discuss the impact of this potential premium in the third section

The determinants of uncertainty around the expected debt ratio

- Start with the debt equation:

$$\Delta debt_t = (r_t - g_t) * debt_{t-1} - pb_t$$

- The variance of unexpected changes in the debt ratio can be written:

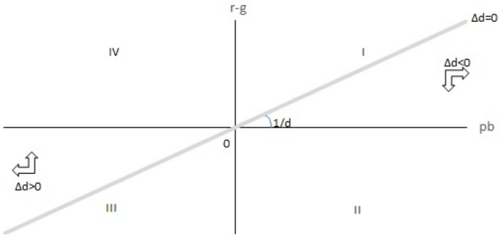
$$var(\Delta debt_t) = var(pb) + debt_{t-1}^2 .var(r-g) - 2.debt_{t-1}.cov(pb, r-g)$$

- The uncertainty in the debt distribution is entirely summarized by the joint distribution of r, g and pb

The determinants of uncertainty around the expected debt ratio

- The debt dynamics equation can be represented by a simple chart

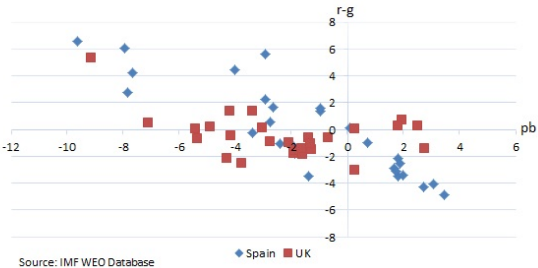
Figure 2. Debt variation: Non-indexed debt



What countries are more likely to benefit?

- Spain more likely than the UK to benefit from indexation:
  - High negative correlation between (r-g) and pb
  - High variance of (r-g)
  - High variance of pb

Figure 3. Interest-growth vs. primary balance (1990 - 2015)



Source: IMF WEO Database

Growth-indexed bond (1)

- Assume X% of debt is composed of growth-indexed bonds:

$$rind_t = g_t + k$$

Note: Throughout this paper we add a constant k in the indexation formula. This constant equalizes the expected return on the indexed bond to the expected return on a similar nominal bond. This constant can be negative if, at the issuance, the expected return over the maturity of the bond is higher than the rate on a nominal bond. This ignores the impact of a potential premium.

- The debt dynamics can be written:

$$\Delta debt_t = [(1-X).(r_t - g_t) + X.k].debt_{t-1} - pb_t$$

- The variance of unexpected changes in the debt ratio can be written:

$$var(\Delta debt_t) = var(pb) + debt_{t-1}^2.(1-X)^2.var(r-g) - 2.debt_{t-1}.(1-X).cov(pb, r-g)$$

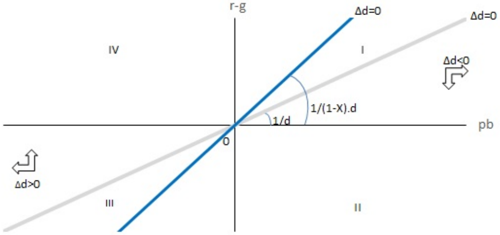
Growth-indexed bond (2)

- Act as fiscal stabilizer: Lower primary balance needed to keep debt ratio unchanged if (r-g) $>$ 0
- Assume: d=1, X=0.5, k=0, r-g=6%

  What primary surplus needed to keep debt-to-GDP ratio unchanged?

  Answer: 1% with indexation, 2% without

Figure 4. Debt variation: Non-indexed debt (grey) vs X% Growth-indexed debt (blue)



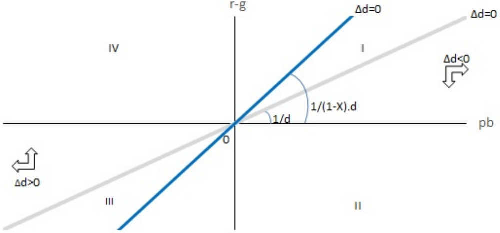
Growth-indexed bond (3)

- Increase 'fiscal space': Higher sustainable debt ratio for a given primary surplus
- Assume: d=1, X=0.5, k=0, max(pb)=6%

  What value of (r-g) would make debt unsustainable?

  Answer 1: 12% with indexation, 6% without: 6%
  Answer 2: 6% with indexation if d=2

Figure 4. Debt variation: Non-indexed debt (grey) vs X% Growth-indexed debt (blue)

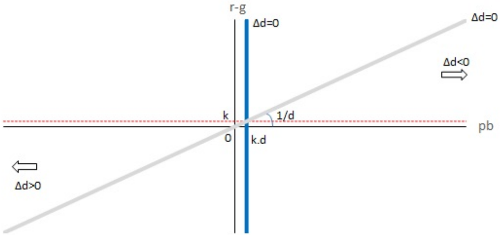


Growth-indexed bond (4)

- Assume 100% of debt is composed of growth-indexed bonds
- The debt dynamics can be written:

$$\Delta debt_t = k.debt_{t-1} - pb_t$$

Figure 5. Debt variation: 100% Growth-indexed debt



Note: In Figure 5, the assumption is made that indexed bonds would have to pay a positive constant if order to have the same expected return as a similar nominal bonds. However that constant (not to be confused with a potential premium) can also be negative or equal to zero.

Growth-indexed bond (5)

- Under which conditions would indexation bring benefits?
- If variance in indexed case is lower than in non-indexed case, i.e. if:

$$\frac{(2-X).debt_{t-1}}{2} > \frac{\rho_{(pb,r-g)} \cdot \sigma_{pb}}{\sigma_{r-g}}$$

- The two obvious advantages of this indexation formula:
  - simple design
  - offers standardization among countries
- However, does not offer protection against shocks to the primary balance. Low growth through the deterioration of the primary balance has played a substantial role in the increase in public debt ratios in AEs (Mauro and Zilinsky 2016).

Fully contingent formula

- Solving equation (1) = 0 gives:

$$rind_t = g_t + \frac{pb_t}{debt_{t-1}} + k$$

- To summarize:

  - (r-g) and pb are negatively correlated in most countries

  - Growth-indexed bonds can help by reducing this negative correlation (up to zero in the case all debt is indexed)

  - The variations can be further reduced by having a positive correlation

Alternative formulas

- We consider 3 alternatives formulas:

$$i) rind_t = c.g_t + k_1$$

$$ii) rind_t = f.z_t + k_2$$

$$iii) rind_t = a.g_t + b.z_t + k_3$$

- Where z is the output gap as a share of potential GDP; variables a, b, c and f are indexation coefficients; and k is a constant added to each formula.
- As previously discussed, this constant k is defined such as the expected return on the indexed bond is equal to the expected return on the non-indexed bond.

Growth rate

- We define the indexation gain as:

$$Gain_1 = var(\Delta debt_t) - var(\Delta debtind_t)$$

- Assuming all debt is indexed, the indexation gain is:

$$Gain_1 = debt_{t-1}^2.[var(r) + (2c - c^2).var(g) - 2.cov(r,g)] - 2.debt_{t-1}.[cov(pb,r) - c.cov(pb,g)]$$

- Optimal indexation coefficient:

$$c* = 1 + \frac{cov(pb, g)}{debt_{t-1}.var(g)}$$

Output gap

- Assuming all debt is indexed, the indexation gain is:

$$Gain_2 = debt_{t-1}^2.[var(r) - f^2.var(z) - 2.cov(r,g) + 2f.cov(z,g)] \\ -2.debt_{t-1}.[cov(pb,r) - f.cov(pb,z)]$$

- Optimal coefficient:

$$f* = \frac{cov(g,z)}{var(z)} + \frac{cov(pb,z)}{debt_{t-1}.var(z)}$$

Growth rate and Output gap

- Assuming all debt is indexed, the indexation gain is:

$$Gain_3 = debt_{t-1}^2.[var(r) - b^2.var(z) + (2a - a^2).var(g) - 2.cov(r,g) + 2(a-1).cov(z,g)] - 2.debt_{t-1}.[cov(pb,r) - a.cov(pb,g) - b.cov(pb,z)]$$

- Optimal coefficients:

$$a* = 1 + \frac{cov(pb,g).var(z) - cov(pb,z).cov(z,g)}{debt_{t-1}.(var(g).var(z) - cov(z,g)^2)}$$

$$b* = \frac{cov(pb,z).var(g) - cov(pb,g).cov(z,g)}{debt_{t-1}.(var(g).var(z) - cov(z,g)^2)}$$

Methodology and Data

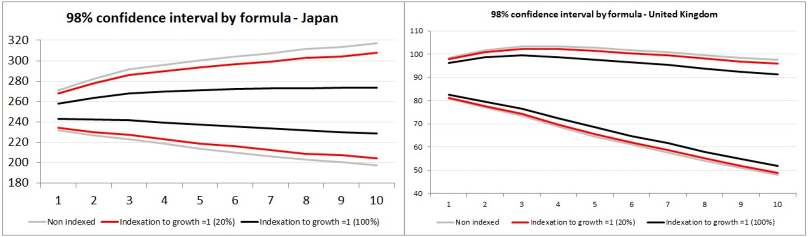
- In order to quantitatively assess the gains obtained from using each formula, we expand the fan-chart approach used in Blanchard, Mauro and Acalin (2016)
- The annual data come from the IMF WEO October 2016 database and cover the period going from 1990 to 2015
- The seven countries are Canada, France, Germany, Italy, Japan, the United Kingdom and the United States

Methodology and Data (continued)

- Expected values of variables equal to the IMF's October 2016 WEO forecasts up to 2021, and extrapolate at the same values from then on
- Assume the distribution of shocks for r, g, z and pb is a multivariate normal distribution, with a covariance matrix given by the empirical covariance matrix estimated over 1990–2015
- The shocks are assumed to be i.i.d. over time, and debt dynamics are generated through random draws (Monte Carlo simulations) from the multivariate distribution
- Have replicated using covariance matrix estimated over 2000-2015, and alternative VAR(1) specification for shocks: Very similar results

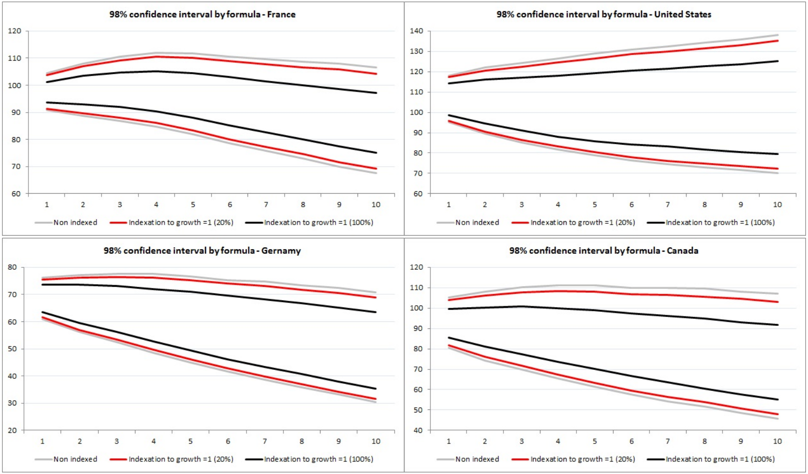
Results: Japan vs. the UK

- Gains from growth-indexed bonds relatively high in Japan, almost non-relevant in the UK



Results (continued)

- In all countries limited gains if growth-indexed bonds represent 20% of total stock of debt (red lines)



Results (continued)

- The reported gains from indexation are equal to the difference between the i-th percentile in the indexed case and the i-th percentile in the non-indexed case.
- Gains from issuing growth-indexed bonds in terms of reduction in the debt distribution are quite limited if the share of indexed debt is equal to 20%

Table 2. Debt distribution after 10 years and associated gains

Country	Non indexed							Index to growth =1 (100%)							Index to growth =1 (20%)						
percentile	1	5	35	50	65	95	99	1	5	35	50	65	95	99	1	5	35	50	65	95	99
Canada	46	54	69	73	78	96	107	9	7	2	0	-2	-10	-15	2	2	0	0	0	-3	-4
France	67	72	83	86	89	100	107	8	6	1	0	-2	-7	-10	2	1	0	0	0	-2	-2
Germany	30	36	46	49	53	65	71	5	4	1	0	-1	-5	-7	1	1	0	0	0	-1	-2
Italy	89	97	111	115	120	136	145	13	9	2	0	-2	-11	-16	3	2	1	0	-1	-3	-5
Japan	197	214	243	252	262	296	317	31	22	5	-1	-7	-29	-43	7	5	1	0	-1	-6	-10
United Kingdom	48	55	67	72	76	90	98	4	3	1	0	-1	-4	-6	1	1	0	0	0	-1	-2
United States	70	79	97	102	108	127	138	9	6	2	0	-2	-9	-13	2	2	0	0	0	-2	-3

Optimal coefficients

- Compute optimal coefficients using formulas described in section II

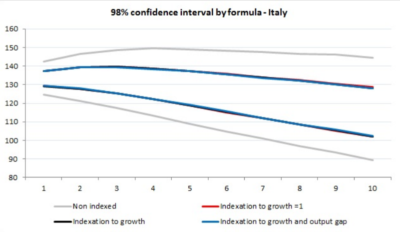
Table 3. Table optimal indexation coefficients by Country

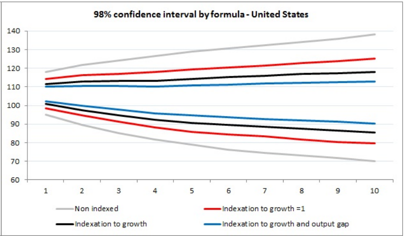
Country	c	f	a	b
Canada	1.57	1.68	1.16	0.92
France	1.69	1.60	1.48	0.35
Germany	1.21	1.82	0.50	1.41
Italy	1.05	0.55	1.09	-0.16
Japan	1.35	1.69	1.04	0.53
UK	1.93	1.90	1.58	0.99
United States	2.03	1.80	1.26	0.98

Note: In order to make the coefficients independent of time, in each formula debt is fixed to its level at t=0. Thus the efficiency of the coefficients is decreasing the further the debt deviates from its initial level. This effect tends to be modest over the estimated 10-year horizon.

Results: Italy vs. the US

- No gains from alternative formulas for Italy, while some gains for the US



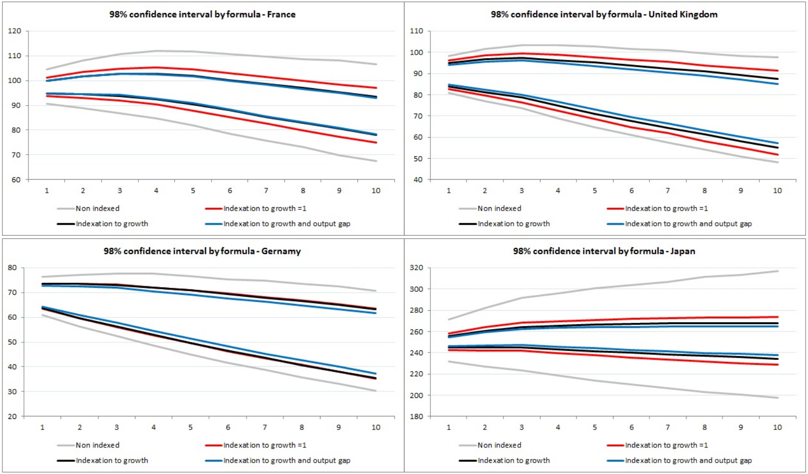


- Regressions of primary balance (R-squared)

R^2	Canada	France	Germany	Italy	Japan	UK	US
ygap	0.50	0.55	0.31	0.06	0.67	0.52	0.73
y	0.22	0.51	0.02	0.01	0.47	0.33	0.37
gap	0.49	0.44	0.25	0.02	0.67	0.42	0.72

Results (continued)

- Additional gains are quantitavely small: On average, provide an additional reduction in the upper tail of about 3 to 6 percentage points



Results (continued)

- Indexation to the growth rate, using the previously computed optimal coefficients, would provide more benefits to all countries, but the additional gains are very limited

Country	Non indexed							Indexation to growth =1							Indexation to growth						
percentile	1	5	35	50	65	95	99	1	5	35	50	65	95	99	1	5	35	50	65	95	99
Canada	46	54	69	73	78	96	107	9	7	2	0	-2	-10	-15	11	8	2	0	-2	-12	-18
France	67	72	83	86	89	100	107	8	6	1	0	-2	-7	-10	11	8	2	0	-2	-9	-13
Germany	30	36	46	49	53	65	71	5	4	1	0	-1	-5	-7	5	4	1	0	-1	-5	-8
Italy	89	97	111	115	120	136	145	13	9	2	0	-2	-11	-16	13	9	2	0	-2	-11	-16
Japan	197	214	243	252	262	296	317	31	22	5	-1	-7	-29	-43	37	25	5	-1	-8	-33	-49
United Kingdom	48	55	67	72	76	90	98	4	3	1	0	-1	-4	-6	7	5	1	0	-2	-7	-10
United States	70	79	97	102	108	127	138	9	6	2	0	-2	-9	-13	15	11	2	-1	-4	-14	-20

Country	Non indexed							Indexation to output gap							Ind. to growth and output gap						
percentile	1	5	35	50	65	95	99	1	5	35	50	65	95	99	1	5	35	50	65	95	99
Canada	46	54	69	73	78	96	107	9	7	2	0	-2	-9	-13	14	10	2	0	-3	-14	-20
France	67	72	83	86	89	100	107	5	4	1	0	-1	-5	-7	11	8	2	0	-2	-9	-14
Germany	30	36	46	49	53	65	71	7	5	1	0	-1	-6	-9	7	5	1	0	-1	-7	-9
Italy	89	97	111	115	120	136	145	-3	-2	0	1	1	4	6	13	9	2	0	-2	-11	-17
Japan	197	214	243	252	262	296	317	25	17	4	-1	-5	-22	-33	40	28	6	-1	-9	-36	-52
United Kingdom	48	55	67	72	76	90	98	3	2	0	0	-1	-3	-4	9	7	1	0	-2	-8	-12
United States	70	79	97	102	108	127	138	15	10	3	0	-3	-13	-19	20	14	3	0	-4	-18	-25

Impact of the premium

- Now consider the impact of potential premium
- Estimate the premium that equalizes the 95-th and 99-th percentiles of the indexed distribution to that of the non-indexed distribution at the final year of the forecast horizon

		growth=1		growth		gap		growth gap	
t=10	d0	95-th	99-th	95-th	99-th	95-th	99-th	95-th	99-th
Canada	92	1,09%	1,56%	1,28%	1,80%	1,02%	1,36%	1,53%	2,13%
France	96	0,70%	0,94%	0,95%	1,32%	0,50%	0,64%	0,97%	1,37%
Germany	71	0,77%	1,09%	0,79%	1,12%	1,02%	1,35%	1,06%	1,38%
Italy	133	0,84%	1,17%	0,85%	1,21%	-0,31%	-0,44%	0,87%	1,23%
Japan	248	1,03%	1,49%	1,20%	1,71%	0,78%	1,11%	1,29%	1,83%
United Kingdom	89	0,48%	0,65%	0,80%	1,09%	0,31%	0,39%	0,97%	1,35%
United States	105	0,75%	1,01%	1,18%	1,60%	1,08%	1,51%	1,51%	2,05%
Average		0,81%	1,13%	1,01%	1,41%	0,63%	0,84%	1,17%	1,62%

Impact of the premium (continued)

- A premium of 100bp over a 10-year period would make indexed debt too costly to provide relevant benefits in terms of debt distribution.

Country	Non indexed							Indexation to growth =1							Indexation to growth						
percentile	1	5	35	50	65	95	99	1	5	35	50	65	95	99	1	5	35	50	65	95	99
Canada	46	54	69	73	78	96	107	16	13	9	7	5	-2	-8	17	15	9	7	5	-4	-10
France	67	72	83	86	89	100	107	16	14	10	9	8	3	0	19	17	11	9	7	0	-4
Germany	30	36	46	49	53	65	71	10	9	6	6	5	1	-1	10	9	6	6	5	1	-1
Italy	89	97	111	115	120	136	145	26	22	16	13	11	3	-2	26	22	16	13	11	3	-2
Japan	197	214	243	252	262	296	317	54	45	29	24	18	-3	-17	60	49	30	23	16	-8	-24
United Kingdom	48	55	67	72	76	90	98	10	10	8	8	7	4	2	14	12	9	7	6	1	-2
United States	70	79	97	102	108	127	138	18	15	11	10	8	1	-2	24	20	12	9	6	-4	-10

Country	Non indexed							Indexation to output gap							Ind. to growth and output gap						
percentile	1	5	35	50	65	95	99	1	5	35	50	65	95	99	1	5	35	50	65	95	99
Canada	46	54	69	73	78	96	107	16	13	9	7	5	-1	-5	20	17	9	7	4	-6	-13
France	67	72	83	86	89	100	107	13	12	10	9	8	5	3	20	17	11	9	7	0	-4
Germany	30	36	46	49	53	65	71	12	10	7	6	4	0	-3	12	10	7	6	4	-1	-3
Italy	89	97	111	115	120	136	145	8	9	13	14	15	20	24	26	22	16	13	11	3	-2
Japan	197	214	243	252	262	296	317	47	39	27	23	19	4	-5	64	52	30	23	16	-11	-27
United Kingdom	48	55	67	72	76	90	98	9	9	8	8	7	6	5	16	14	9	7	6	0	-4
United States	70	79	97	102	108	127	138	24	19	12	9	7	-2	-8	30	24	13	9	5	-8	-15

Non-linearities in the premium

- The premiums were computed over a 10-year period. But as we increase the time horizon (here to 20 years) the impact of a rise in the baseline tend to dominate the impact of a lower distribution around it

		growth=1		growth		gap		growth gap	
t=20	d0	95-th	99-th	95-th	99-th	95-th	99-th	95-th	99-th
Canada	92	0,65%	0,93%	0,79%	1,12%	0,66%	0,86%	0,96%	1,31%
France	96	0,48%	0,68%	0,70%	0,98%	0,36%	0,49%	0,71%	1,00%
Germany	71	0,53%	0,74%	0,54%	0,74%	0,72%	0,95%	0,73%	0,96%
Italy	133	0,67%	0,94%	0,68%	0,96%	-0,30%	-0,34%	0,70%	0,98%
Japan	248	0,69%	0,97%	0,82%	1,12%	0,55%	0,73%	0,88%	1,20%
UK	89	0,34%	0,43%	0,59%	0,77%	0,26%	0,28%	0,73%	0,92%
United Stat	105	0,48%	0,69%	0,76%	1,07%	0,71%	0,98%	0,97%	1,36%
Average		0,55%	0,77%	0,70%	0,96%	0,42%	0,57%	0,81%	1,10%

Conclusion

- Growth-indexed bonds probably best formula option, alternative formulas bring additional benefits but too complex
- Limited share of indexation provide few benefits and may imply higher cost: how to move from an equilibrium to another?
- Need to tackle practical issues (timing of payment, data revisions, methodological changes, treatment of negative coupons, etc.)
- Bottom line: Some potential benefits, but may not materialize in practice ...

Tables

- Table 1a. Correlations

Country	corr(g,gap)	corr(g,pb)	corr(g,r)	corr(gap,pb)	corr(gap,r)	corr(pb,r)	corr(pb,r-g)
Canada	0,54	0,47	-0,03	0,70	-0,49	-0,02	-0,36
France	0,72	0,71	0,38	0,66	0,27	0,17	-0,57
Germany	0,66	0,13	-0,14	0,50	-0,13	-0,54	-0,39
Italy	0,39	0,12	0,71	-0,14	0,02	0,00	-0,14
Japan	0,81	0,69	0,48	0,82	0,48	0,68	-0,59
United Kingdom	0,46	0,58	0,57	0,65	0,14	0,47	-0,41
United States	0,62	0,61	0,25	0,85	0,58	0,31	-0,62
average	0,60	0,47	0,31	0,58	0,12	0,15	-0,44
median	0,62	0,58	0,38	0,66	0,14	0,17	-0,41
min	0,39	0,12	-0,14	-0,14	-0,49	-0,54	-0,62
max	0,81	0,71	0,71	0,85	0,58	0,68	-0,14

Tables

- Table 1b. Variances-Covariances

Country	cov(g,gap)	cov(g,pb)	cov(g,r)	cov(gap,pb)	cov(gap,r)	cov(pb,r)	cov (pb, r-g)	var(z)	var(r)	var(g)	var(pb)	var(r-g)
Canada	3,20	3,78	-0,21	4,63	-2,51	-0,12	-3,90	4,93	5,35	7,20	8,88	12,98
France	1,77	1,93	0,88	1,51	0,53	0,36	-1,57	2,10	1,85	2,90	2,51	3,00
Germany	4,20	0,52	-0,34	1,52	-0,24	-1,42	-1,94	2,46	1,59	16,47	4,37	5,78
Italy	2,05	0,60	6,40	-0,44	0,09	0,02	-0,58	3,14	9,36	8,64	3,05	5,20
Japan	4,00	5,89	0,72	5,05	0,52	1,27	-4,63	3,57	0,33	6,87	10,71	5,76
UK	1,43	3,28	1,13	2,91	0,23	1,37	-1,91	2,48	1,02	3,95	8,22	2,70
US	2,48	4,20	0,34	6,52	0,90	0,66	-4,05	4,65	0,45	3,44	11,52	4,13
average	2,73	2,88	1,27	3,10	-0,07	0,31	-2,65	3,33	2,85	7,07	7,04	5,65
median	2,48	3,28	0,72	2,91	0,23	0,36	-1,94	3,14	1,59	6,87	8,22	5,20
min	1,43	0,52	-0,34	-0,44	-2,51	-1,42	-4,63	2,10	0,33	2,90	2,51	2,70
max	4,20	5,89	6,40	6,52	0,90	1,37	-0,58	4,93	9,36	16,47	11,52	12,98

Tables

- Annex1. Regressions of primary balance

VARIABLES	Canada pb	France pb	Germany pb	Italy pb	Japan pb	UK pb	US pb
y	0.150	0.461***	-0.356	0.121	0.094	0.513***	0.088
	[0.151]	[0.150]	[0.257]	[0.156]	[0.200]	[0.137]	[0.362]
gap	0.843***	0.333	1.001***	-0.219	1.311***	0.880***	1.224***
	[0.182]	[0.228]	[0.299]	[0.175]	[0.334]	[0.267]	[0.291]
Constant	0.541	-2.465***	1.361*	1.139*	-3.468***	-4.127***	-3.278*
	[0.591]	[0.504]	[0.668]	[0.625]	[0.499]	[0.870]	[1.653]
Observation	26	26	21	26	26	26	15
R-squared	0.503	0.554	0.306	0.055	0.670	0.516	0.725

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Tables

- Annex1. Regressions of primary balance

VARIABLES	Canada pb	France pb	Germany pb	Italy pb	Japan pb	UK pb	US pb
y	0.525***	0.665***	0.148	0.069	0.858***	0.831***	1.022***
	[0.165]	[0.072]	[0.182]	[0.152]	[0.149]	[0.125]	[0.229]
Constant	-1.721**	-3.307***	-0.208	1.591***	-5.109***	-5.983***	-7.323***
	[0.776]	[0.268]	[0.374]	[0.515]	[0.472]	[0.750]	[1.267]
Observation	26	26	21	26	26	26	15
R-squared	0.223	0.509	0.018	0.013	0.473	0.332	0.372

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Tables

- Annex1. Regressions of primary balance

VARIABLES	Canada pb	France pb	Germany pb	Italy pb	Japan pb	UK pb	US pb
gap	0.940***	0.722***	0.707***	-0.140	1.417***	1.175***	1.279***
	[0.129]	[0.165]	[0.189]	[0.176]	[0.253]	[0.291]	[0.213]
Constant	1.260***	-0.796***	0.390	1.665***	-3.311***	-1.705***	-2.919***
	[0.421]	[0.219]	[0.421]	[0.411]	[0.433]	[0.489]	[0.489]
Observation	26	26	21	26	26	26	15
R-squared	0.490	0.435	0.246	0.020	0.668	0.416	0.723

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1