A "Budget at Risk" Approach to Monitoring Sovereign Debt Risk

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MARKET RISK MEASUREMENT FOR SOVEREIGN DEBT

- VaR is the standard approach to market risk measurement
  - VaR is about quantifying the most likely market value movements within a given confidence interval over a certain time horizon
  - Market risk is usually assessed through statistical parameters (volatility and correlation) and Delta (sensitivity) valuation
- However, the underlying assumption concerning the normality of the probability density function is a very strong one. Normality does not hold true in extreme market conditions (e.g., flight to quality, panic selling). Correlation increases and historical volatility does not help

MARKET RISK MEASUREMENT FOR SOVEREIGN DEBT

- More sophisticated methodologies are available, including non-parametric VaR and “crashmetrics” approaches
- Quantitative analysis must be complemented by professional judgement in managing risk of complex portfolios ...
- … and sovereign debt management responds to very special needs:

MARKET RISK MEASUREMENT FOR SOVEREIGN DEBT

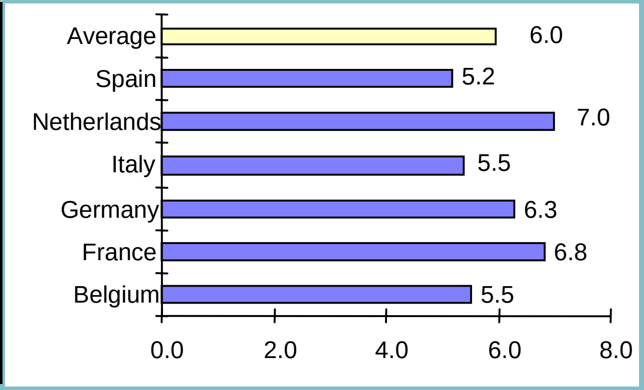
- Mark-to-market valuations assume that portfolios can be liquidated and reinvested quickly. Constraints:
  - government securities' size, market liquidity
  - market maintenance
- If the borrower's time horizon is structurally long term, unrealized capital losses on a mark-to-market basis can be offset by capital gains over time
- Although actual refinancing and interest rate risks decline along with maturity, mark-to-market valuation makes long-term (fixed rate) borrowing to appear more risky (because of higher price sensitivity)
- Need to avoid both high debt servicing cost fluctuations and concentration of refinancing risk

Average Life of Selected European Governments' Debt

Weighted by nominal amounts

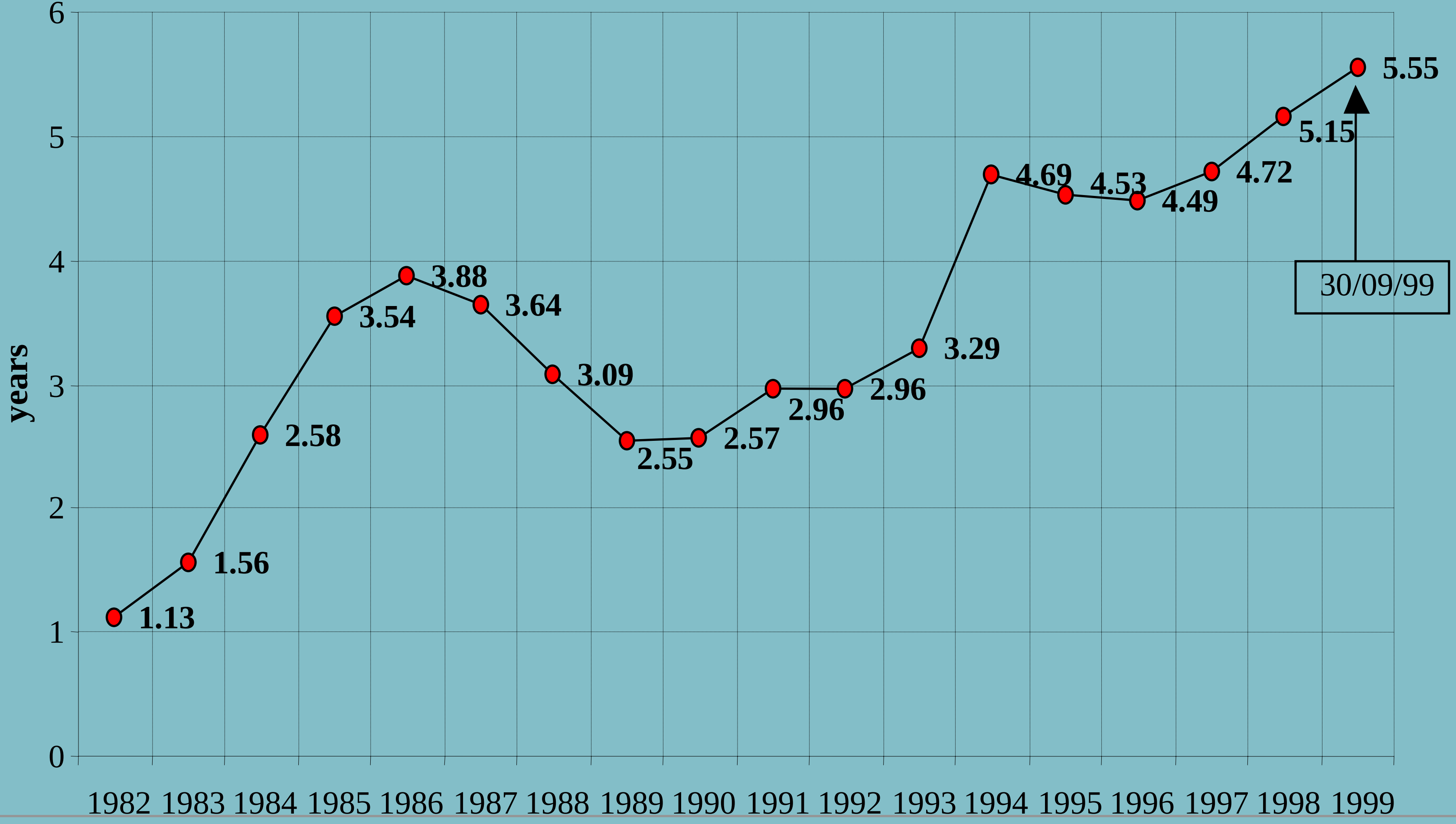
Average life *(in years)*	**Bonds**	**Floaters**	**T-Bills**	**Total**
Belgium	6.9		1.0	5.5
France	7.4		1.0	6.8
Germany	6.4		1.0	6.3
Italy	6.7	3.8	1.0	5.5
Netherlands	7.4		1.0	7.0
Spain	6.6		1.0	5.2
Total	**6.9**	**3.8**	**1.0**	**6.0**

Average life of government debt
In years

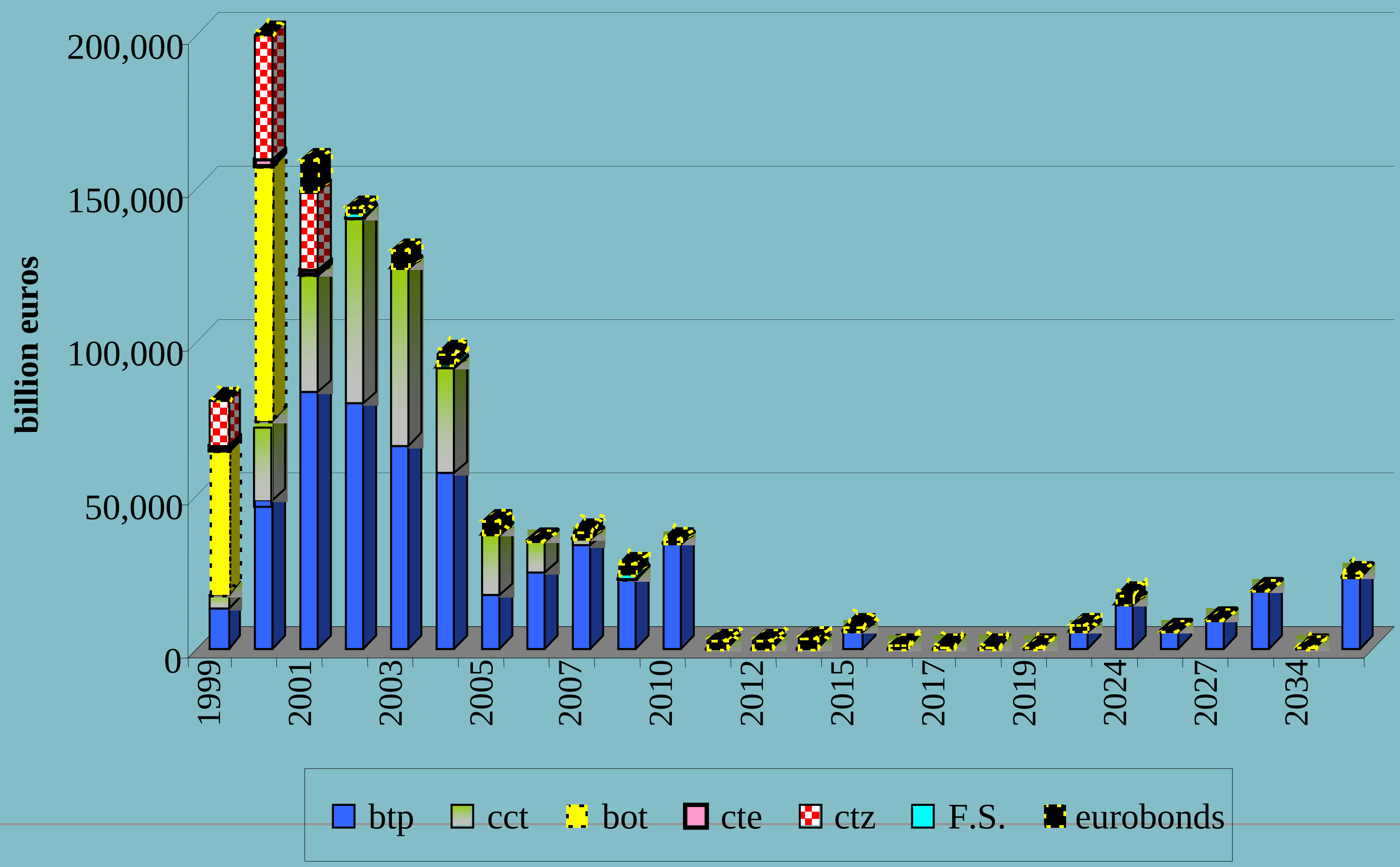


- **The average life of the Italian government debt is relatively low by European standards**
- **Continued increase thanks to negative net issuance of T-Bills and higher share of long-dated bonds**

ITALY’S CENTRAL GOVERNMENT DEBT - AVERAGE LIFE



ITALY'S CENTRAL GOVERNMENT DEBT - MATURITY PROFILE

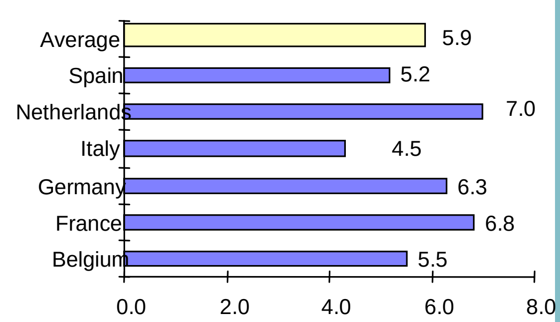


Average Interest Re-Fixing Period of Selected European Governments' debt

Average interest fixing period *(in years)*	**Bonds**
Belgium	5.5
France	6.8
Germany	6.3
Italy	4.5
Netherlands	7.0
Spain	5.2
Total	**5.9**

Weighted by nominal amounts

Average interest re-fixing period
In years

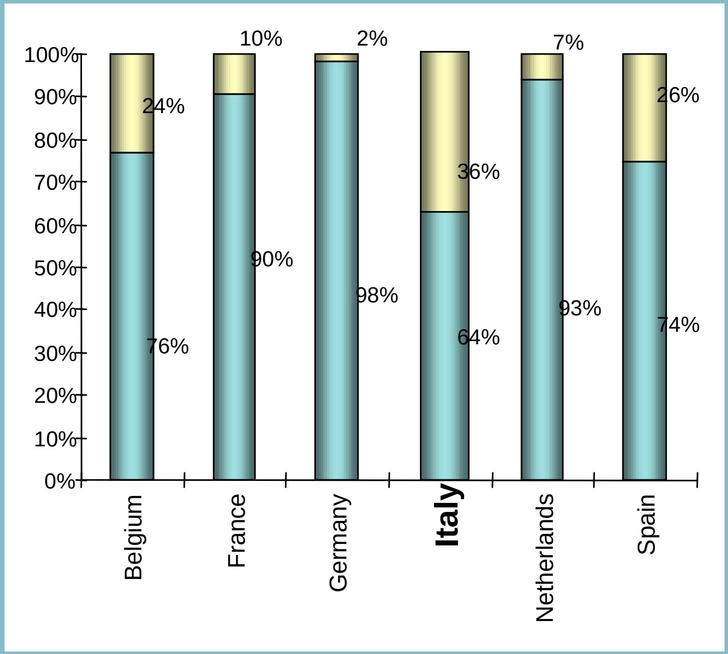


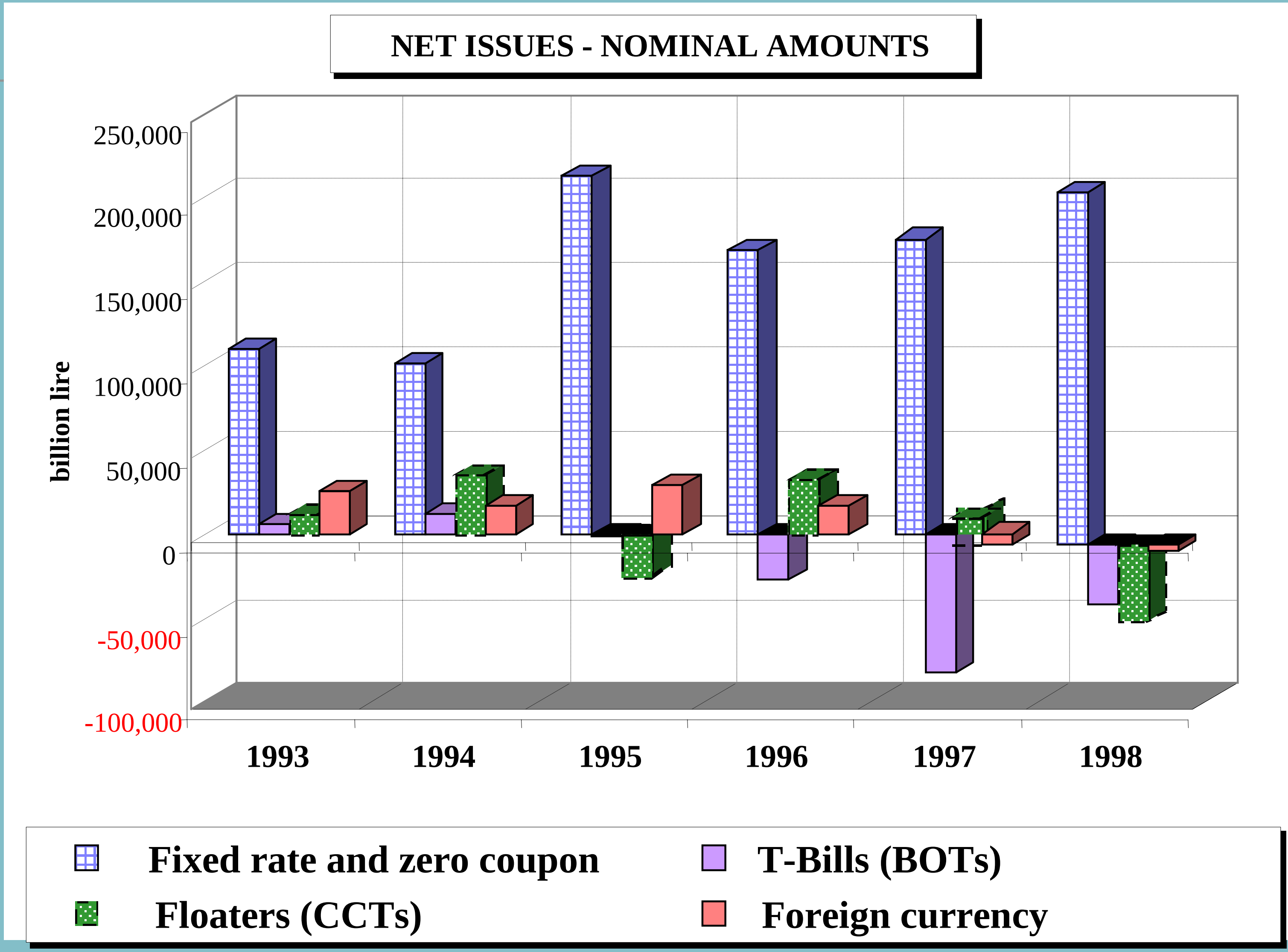
- **Outstanding BOTs and CCTs impact the average interest re-fixing period**
- **Relatively low interest re-fixing period implies higher interest rate servicing volatility**

Fixed versus floating debt ratios

Italy's floating rate liabilities are still high, but rapidly declining

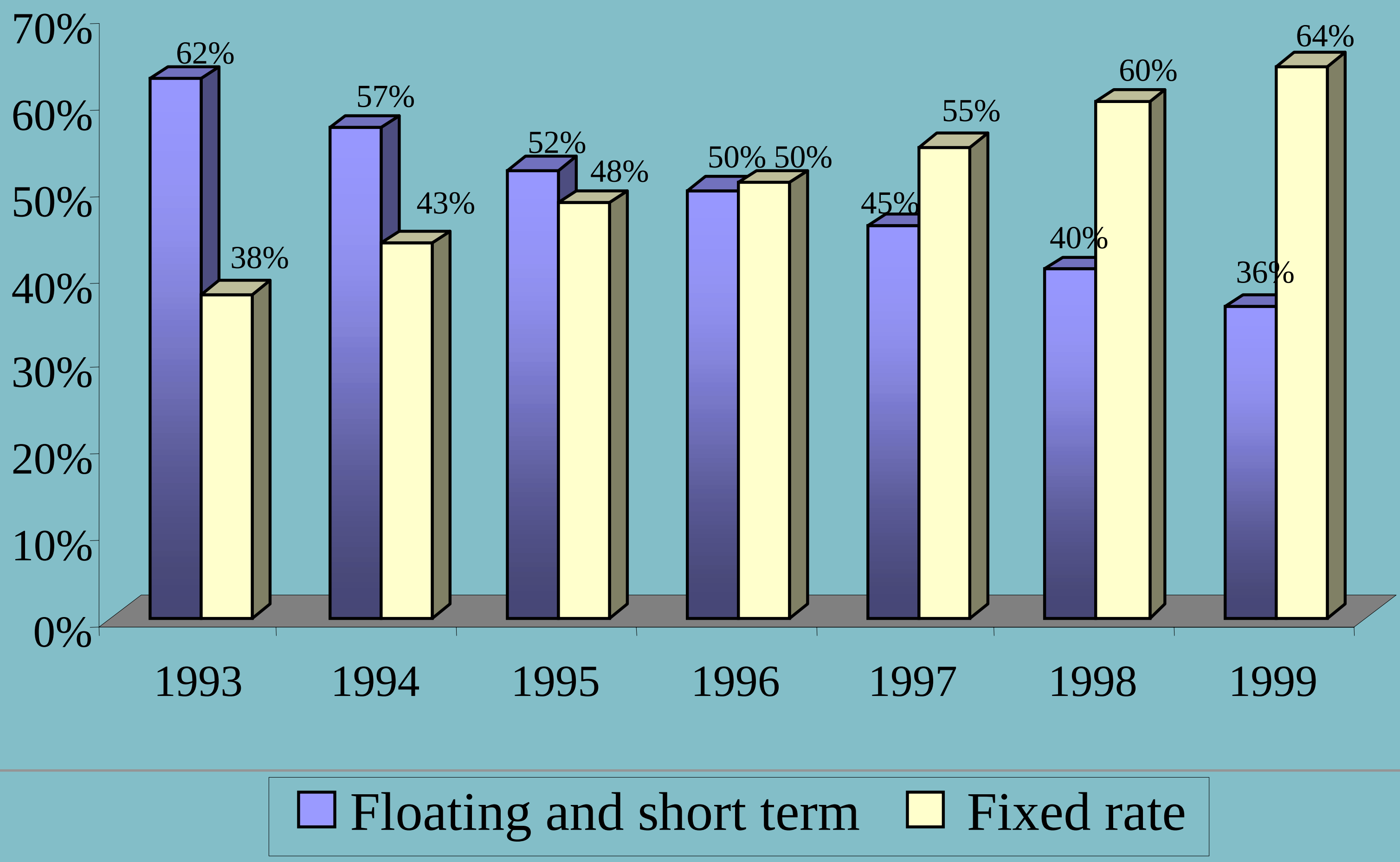
Fixed versus floating
In relative terms





NET ISSUES - NOMINAL AMOUNTS
billion lire
250,000
200,000
150,000
100,000
50,000
0
-50,000
-100,000
1993
1994
1995
1996
1997
1998
Fixed rate and zero coupon
T-Bills (BOTs)
Floaters (CCTs)
Foreign currency

BREAKDOWN OF ITALY'S CENTRAL GOVERNMENT DOMESTIC DEBT BY INTEREST RATE INDEXATION



A definition of Budget-at-Risk

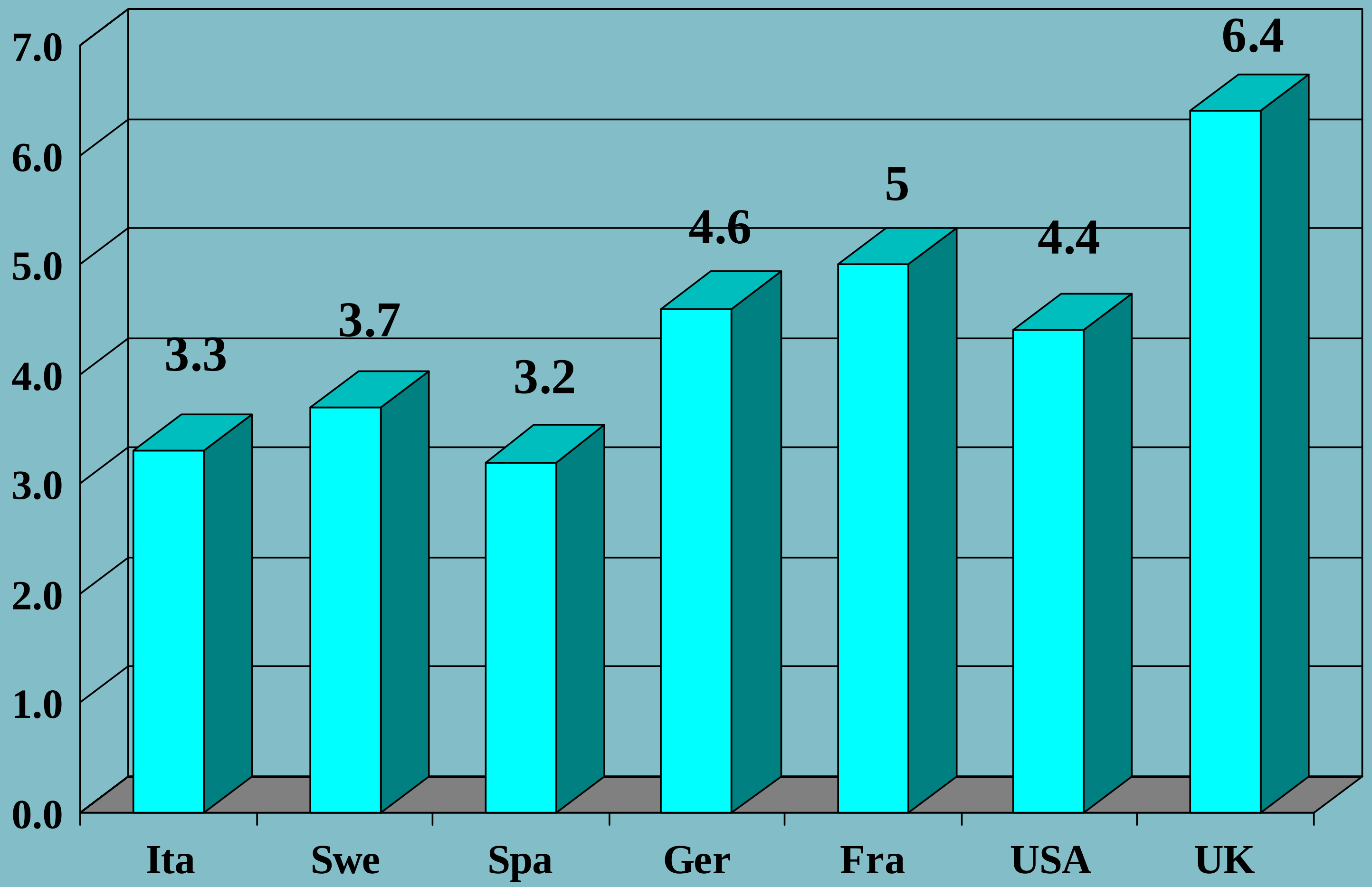
- The potential increase in public interest expenditure to be expected in a given time horizon for a specified confidence interval

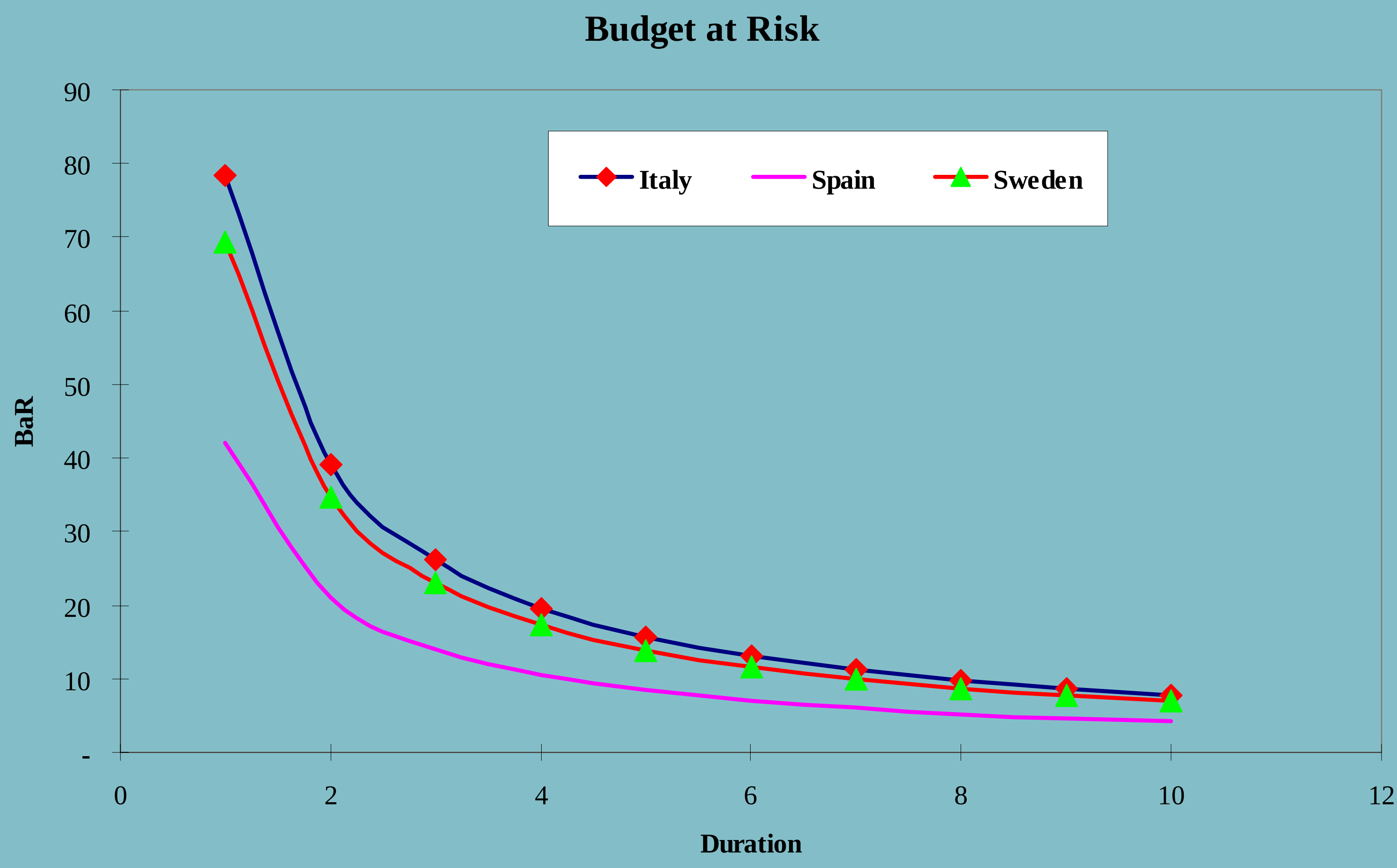
- BaR = **Nominal** * (**1/ Duration**) * Confidence Interval * Interest rate volatility * t^0.5

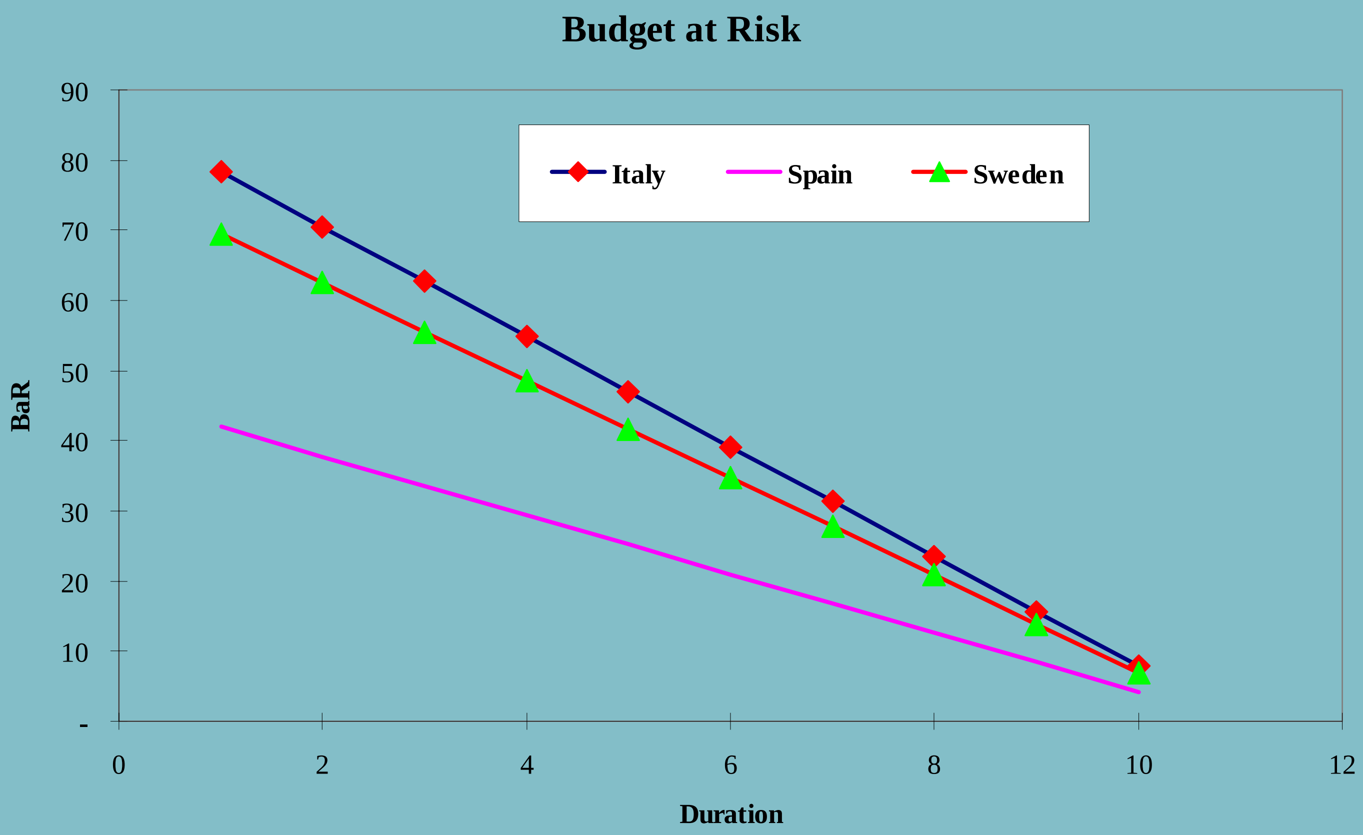
Budget-at-Risk: Characteristics

- **Is not about market value**
- **Is an inverse function of duration**
- **Needs to be adjusted for convexity**
- **Suffers from same limitations as VaR analysis (normal distribution, historical vols)**
- **Uses duration as an average measure of interest re-fixing periods. Duration also relates to refinancing risk**

Public Debt Duration in Selected European Countries




Budget at Risk
90
80
70
60
50
40
30
20
10
-
BaR
0
2
4
6
8
10
12
Duration
Italy
Spain
Sweden


Budget at Risk
Italy
Spain
Sweden
BaR
90
80
70
60
50
40
30
20
10
-
0
2
4
6
8
10
12
Duration