

Backus/October 29, 1998

Macrofoundations of Interest Rates

0. Overview

- Top down and bottom up
- Bond market analysis: Examples
- Supply and demand for capital
- Inflation and interest rates
- Forecasting with forward rates

1. Information Sources for Fixed Income Analysis

Asset Class	Relevant Information
Domestic bonds	Interest rates (macro) Firm's prospects (credit risk)
Domestic equity	State of the economy Firm's prospects (earnings, say) Interest rates
Emerging market debt	Country risk Interest rates Firm's prospects

Remarks:

- Treasury debt: cash flows known, macroeconomic factors predominant
- Corporate debt: firm's condition affects credit risk (junk is an extreme case)
- Equity: present value requires forecasts of cash flows and risk-adjusted interest rates
- Emerging market debt: need both "top down" (country analysis) and "bottom up" (firm analysis) information

2. Examples of Fixed Income Analysis

- Morgan Stanley (Roach), January 1998:

I sense that asset values are moving further away from their intrinsic equilibria — a classic sign of investor panic. Nowhere does this show up more clearly than in the US bond market. Long treasuries are priced for the virtual absence of inflationary pressures over the next decade. Based on inflation-indexed TIPS, the inflation premium in 10-year treasuries is expected to average just 1.7% over the next 10 years.

- Merrill Lynch, January 1998:

1998 will likely bring low inflation, declining interest rates, and slower growth globally, according to senior strategists at Merrill Lynch.

- Salomon Smith Barney, December 1997:

Governments. (i) We think the current flat treasury curve reflects the expected direction of interest rates. (ii) The November (government) deficit was lower than estimates, but it appears that some politicians are ready to spend a possible surplus before it appears.

Corporates. Several triple-B sectors have weakened appreciably (gaming, paper, metals).

Emerging markets. A roller coaster week with huge volatility. Investors took their cues from Asian developments. Liquidity remained low: thin trading and large bid-ask spreads.

3. Supply and Demand for Capital

- Sources = Uses of Funds:

$$S = I + \text{Def} + \text{CA}$$

$$S = \text{Saving}$$

$$I = \text{Physical Investment (P\&E of PP\&E)}$$

$$\text{Def} = \text{Government Deficit}$$

$$\text{CA} = \text{Current Account (net purchases of foreign assets)}$$

- Things that make interest rates high:
 - attractive investment opportunities
 - government deficits
 - economic booms (both S and I rise, but I rises more)
- Things that make interest rates low:
 - high saving rate
 - policies that make your country attractive to foreign investors

4. Inflation and Interest Rates

- Fisher relation:

$$\text{Nominal Rate} = \text{Real Rate} + \text{Expected Inflation}$$

- Nominal rate is our usual, real rate adjusts it for inflation
- Time interval depends on the choice of rate:
 - Short rates refer to inflation over short periods
 - Long rates refer to inflation over long periods
 - Forward rates refer to a specific period

- Long-run relation (quantity theory):

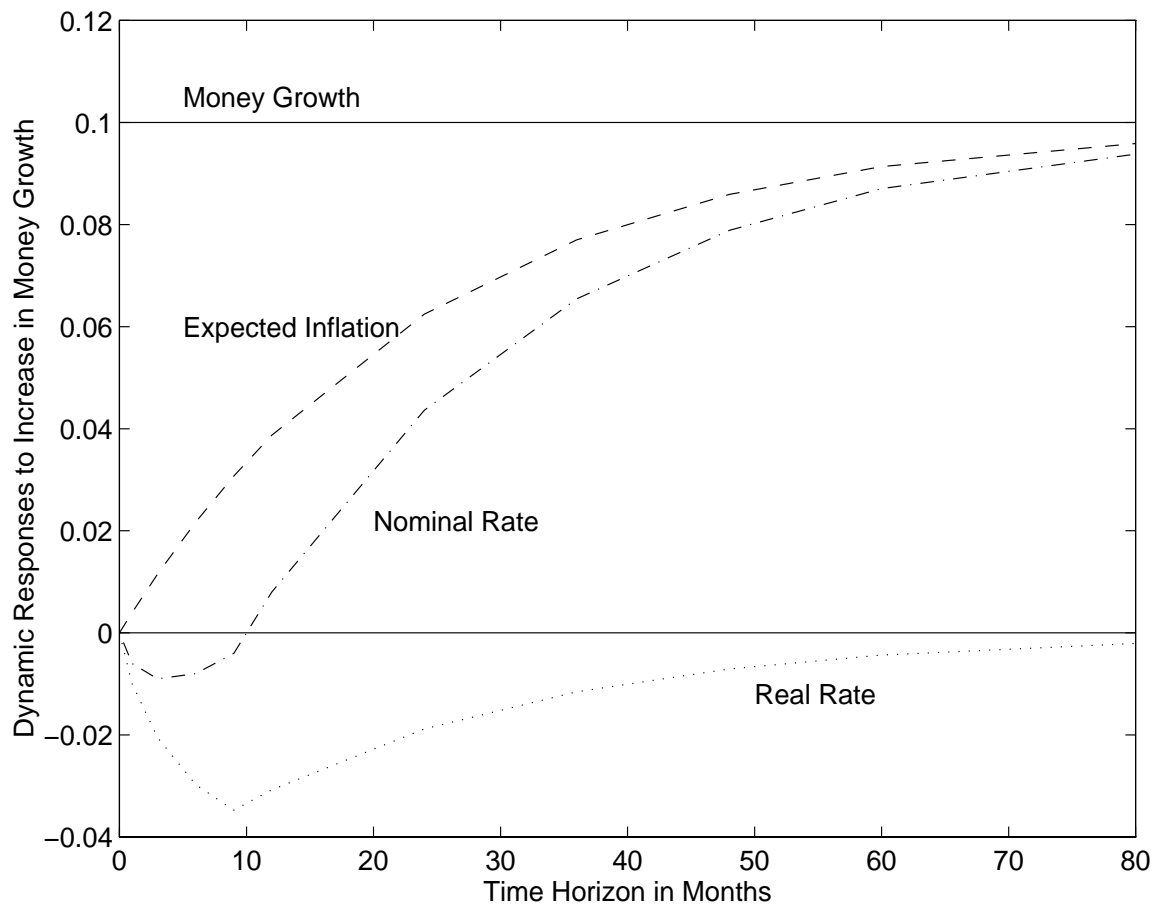
$$\text{Inflation} = \text{Money Growth} - \text{Output Growth}$$

- Overwhelming global evidence for multi-year averages:

$$\text{High Money Growth} \Rightarrow \text{High Inflation} \Rightarrow \text{High Rates}$$

4. Inflation and Interest Rates (continued)

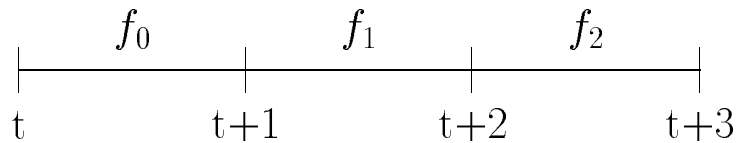
- Short-run effects of higher money growth:
 - Increased liquidity reduces rates initially
 - Inflation may respond slowly to money growth



- Remark: Short-run impact (liquidity) opposite to long-run impact (inflation)

5. Forecasting with Forward Rates

- Recall the timing of forward rates quoted at date t :



- Expectations hypothesis:

$$f_{n,t} = E_t(y_{1,t+n}) + \text{Risk Premium}$$

(E_t means “expected at date t ”)

Hypothesis: risk premiums are constant
(they can vary with maturity but not with time)

- If we know the risk premium, we can reverse the equation and infer expected interest rates:

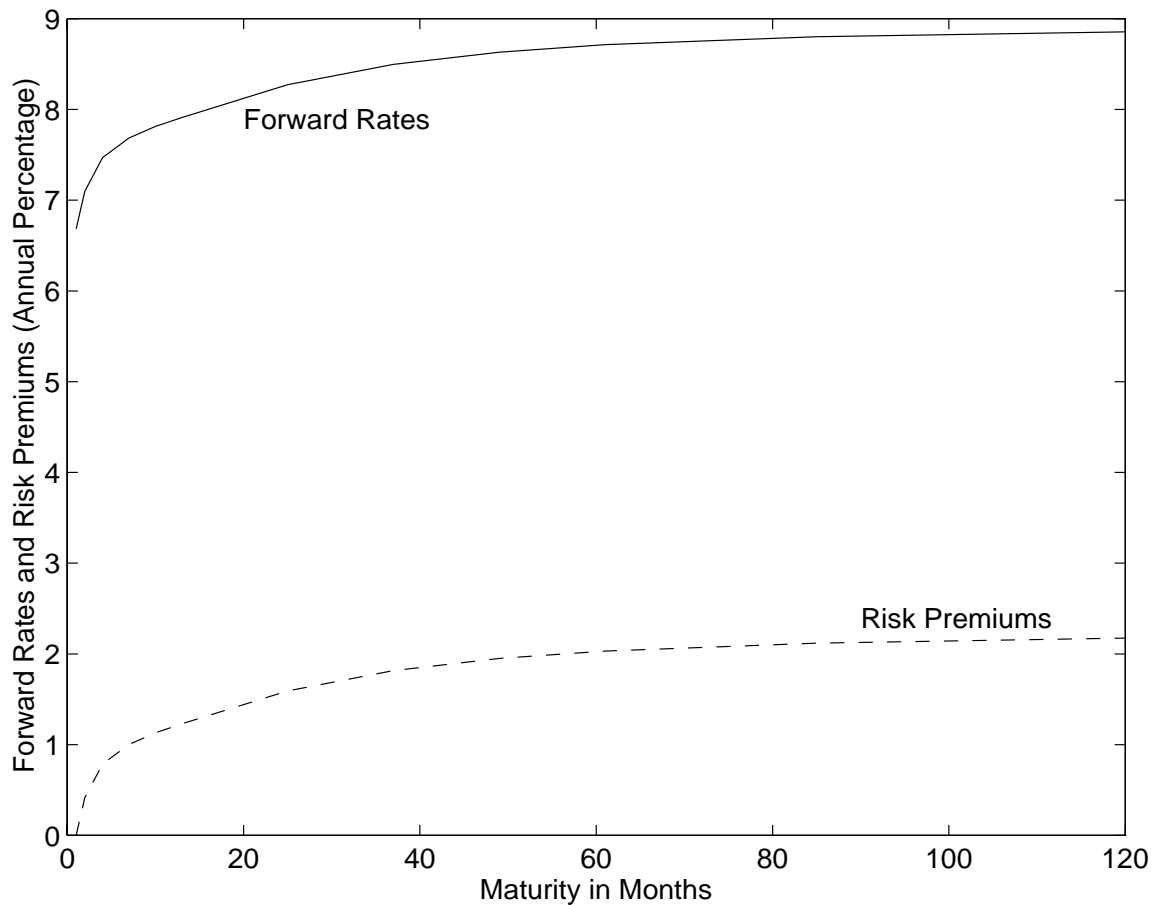
$$E_t(y_{1,t+n}) = f_{n,t} - \text{Risk Premium}$$

5. Forecasting with Forward Rates (continued)

- Estimating risk premiums:

$$\text{Risk Premium} \cong \text{Average Value of } (f_n - y_1)$$

- Average forward rates and estimated risk premiums (estimated with monthly data, 1970-95):



6. Forward Rates at Work

- Example 1: Our usual numbers revisited

Maturity	Spot Rate	Forward Rate	Risk Premium
0.5	5.99	5.99	0.00
1.0	6.05	6.10	0.36
1.5	6.10	6.20	0.56
2.0	6.15	6.29	0.75

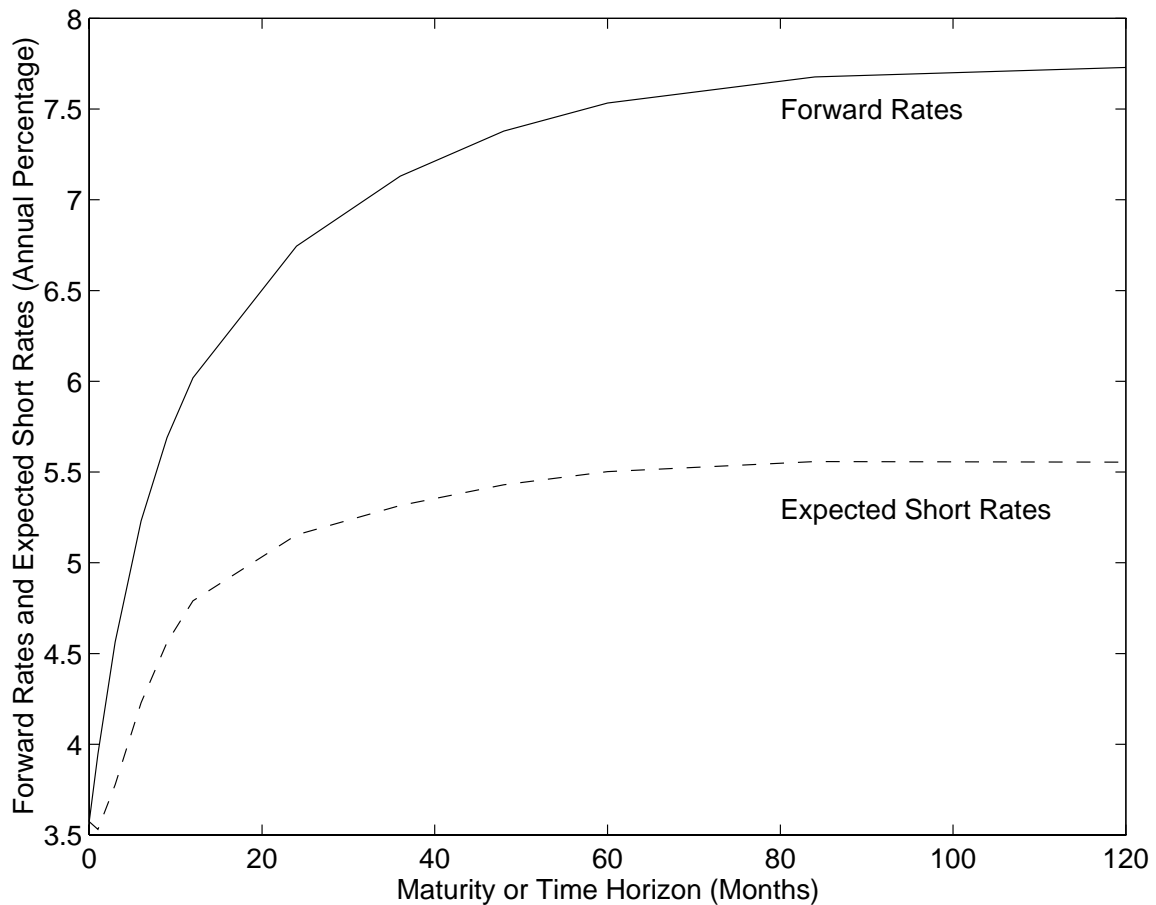
(estimated risk premiums from treasury data, 1970-95)

- Forecasts of 6-month spot rate y_1 :

Horizon	Forward Rate	– Risk Premium	= Forecast
0.0	5.99	0.00	5.99
0.5	6.10	0.36	5.74
1.0	6.20	0.56	5.64
1.5	6.29	0.75	5.54

6. Forward Rates at Work (continued)

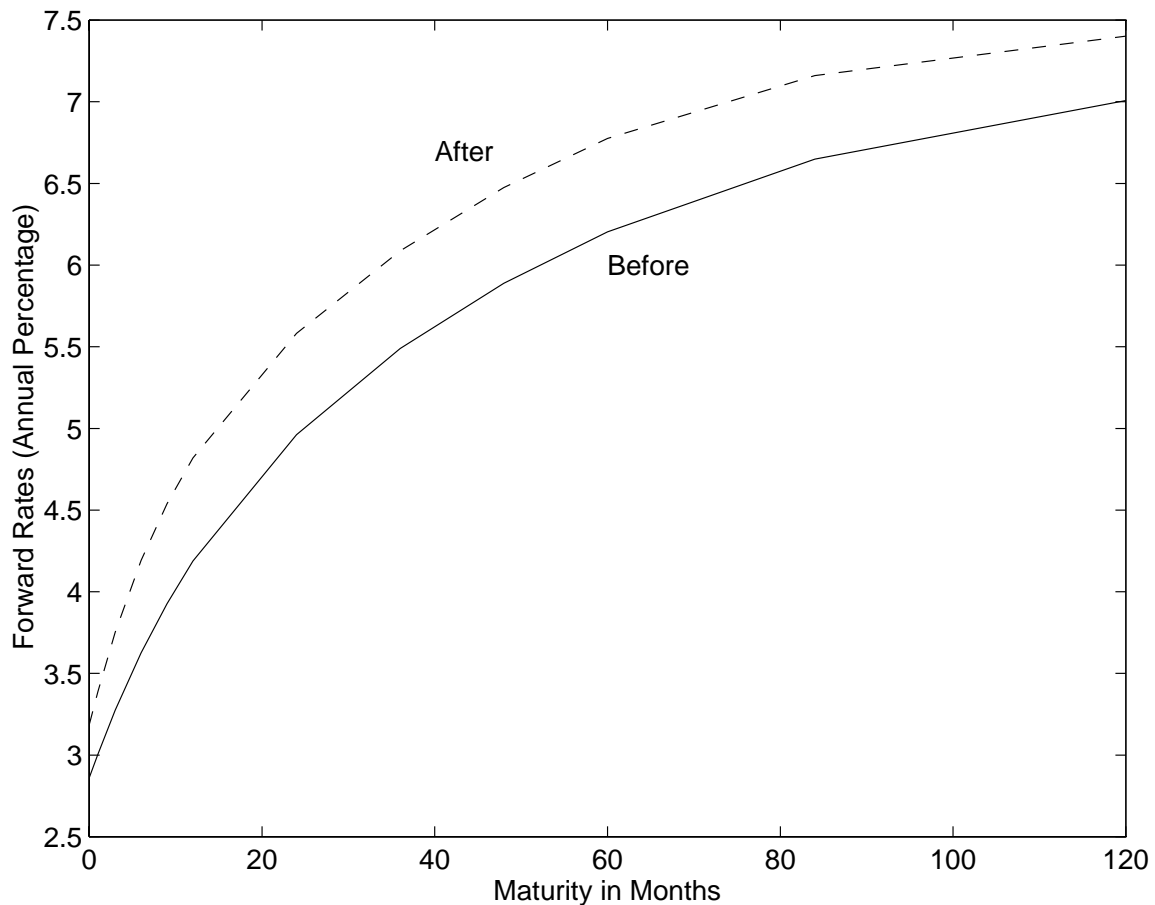
- Example 2: April 1994 (the middle of the great yield rise)



- Remark: steeper than average forward rate curve suggests increasing expected short rates

6. Forward Rates at Work (continued)

- Example 3: February 1994 (before and after the shock)
 - Fed's plan: 50 bp rise in short rates would reduce future inflation, hence reduce (or barely increase) long rates
 - What happened:



- Remark: you never know!

6. Forward Rates at Work (continued)

- Example 4: Inflation-Indexed bonds, January 1998

- Background:
 - First issued in 1997 in US, earlier in UK and Canada
 - 5- and 10-year initial maturities
 - Principal indexed to inflation (rises with CPI)
 - Coupons a fixed percentage of principal (3.5%)
 - Yield on “stripped principal” gives us a direct indication of the real interest rate of the same maturity
 - Difference from spot rate of same maturity is an estimate of expected inflation

- Data, January 1998:
 - 10-year yield on indexed bond: 3.7%
 - 10-year yield on standard bond: 5.8%

- Estimate: expected inflation is 2.1% (average over 10 years) (this is a little crude — the yields are contaminated by coupons — but probably pretty close)

Summary

- Interest rates reflect supply and demand for capital
- They also reflect expectations of the future
- An example is future inflation
- One version is the expectations hypothesis: the shape of the forward rate curve reflects the expected path of the short rate (plus risk premiums)