Public Affairs 974-1
Monetary and Financial Policy in the Wake of the Financial Crisis
(10/4-11/12)

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Outline

- Credit Spreads and Ratings Agencies
- The Term Structure
- The Term Structure and Predictive Power

Ratings & the Risk Structure of Interest Rates

- Default is one of the most important risks a bondholder faces.
- In fact, independent companies (rating agencies) have arisen to evaluate the creditworthiness of potential borrowers.
  - These companies estimate the likelihood that the corporate or government borrower will make a bond's promised payments.
  - The government has acknowledged a few firms as "nationally recognized statistical rating organizations" (NRSROs).
  - Moody's, Standard & Poors, Fitch

Bond Ratings

- Firms or governments with an exceptionally strong financial position carry AAA or Aaa.
  - Ex: U.S. Government, ExxonMobil, Microsoft
- The top four categories are considered investment-grade bonds.
  - These bonds have a very low risk of default.
  - Reserved for most government issuers and corporations that are among the most financially sound.
- Contrast with non-investment-grade or speculative/highly speculative grade bonds.

  - regulated institutional investors can't hold these.

	Moody's	Standard & Poor's	Description	Examples of Issuers with Bonds Outstanding in 2009
Investment Grade	Aaa	AAA	Bonds of the best quality with the smallest risk of default. Issuers are exceptionally stable and dependable.	U.S. government ExxonMobil Microsoft
	Aa	AA	Highest quality with slightly higher degree of long-term risk.	General Electric Procter and Gamble Spain
	A	A	High-medium quality, with many strong attributes but somewhat vulnerable to changing economic conditions.	Bank of America Oracle China Italy
	Baa	BBB	Medium quality, currently adeqauate but perhaps unreliable over the long term.	General Mills Time Warner Russia
Noninvestment, Speculative Grade	Ba	BB	Some speculative element, with moderate security but not well safeguarded.	Goodyear Tire Sears Turkey
	B	B	Able to pay now but at risk of default in the future.	Ford Motor Hertz Argentina
Highly Speculative	Caa	CCC	Poor quality, clear danger of default.	Beazer Homes USA Ukraine
	Ca	CC	Highly speculative quality, often in default.	Ambac
	C	C	Lowest-rated, poor prospects of repayment though may still be paying.	
	D	D	In default.	Champion Enterprises CIT Group

LESSONS FROM THE CRISIS
RATING AGENCIES

- What caused the ratings errors?
  - Data didn't have sufficient information.
  - Firms hire the agencies to consult on what types of MBS have the highest ratings and then rate them, which was a conflict of interest.
  - Ratings agencies are compensated by the issuers of the bonds.
  - Agencies used a single rating scale to represent default probabilities, independent of other characteristics like liquidity.
    - This may have led investors to underestimate other important risks.

Commercial Paper

- Commercial paper is a short-term version of a bond.
  - The borrower offers no collateral so the debt is *unsecured*.
  - Commercial paper is
    - Issued on a discount basis, as a zero-coupon bond specifying a single future payment with no associated coupon payments.
    - Has maturity of less than 270 days, usu. 5-45 days.
    - Rated P-1, P-2 at issue, or speculative after downgrades
  - More than 1/3 is held by money-market mutual funds.

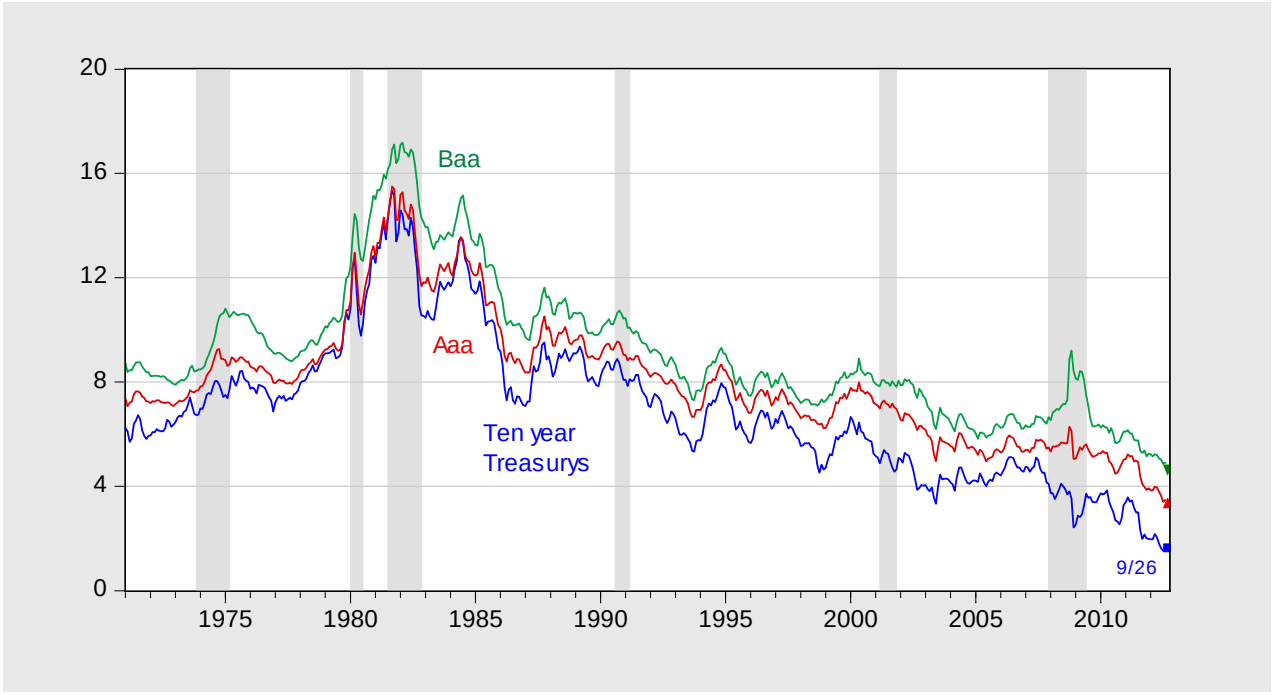
Commercial Paper

- Most commercial paper is issued with a maturity of 5 to 45 days and is used exclusively for short-term financing.
- The rating agencies rate the creditworthiness of commercial paper issuers in the same way they do bond issuers.
- Almost all carry Moody's P-1 or P-2 rating
  - P stands for prime grade commercial paper.
  - Speculative-grade commercial paper does

Commercial Paper

Table 7.2 Commercial Paper Ratings

	Moody's	Standard & Poor's	Description	Examples of Issuers with Commercial Paper Outstanding in 2009
Investment or Prime Grade	P-1	A-1+, A-1	Strong likelihood of timely repayment.	Coca-Cola Procter & Gamble China
	P-2	A-2	Satisfactory degree of safety for timely repayment.	General Mills Time Warner Malaysia
	P-3	A-3	Adequate degree of safety for timely repayment.	Alcoa Cardinal Health, Inc. India
Speculative, below Prime Grade		B, C	Capacity for repayment is small relative to higher-rated issuers.	Sears GMAC Turkey
Defaulted		D		Lehman Brothers


20
16
12
8
4
0
Baa
Aaa
Ten year
Treasurys
9/26
1975
1980
1985
1990
1995
2000
2005
2010

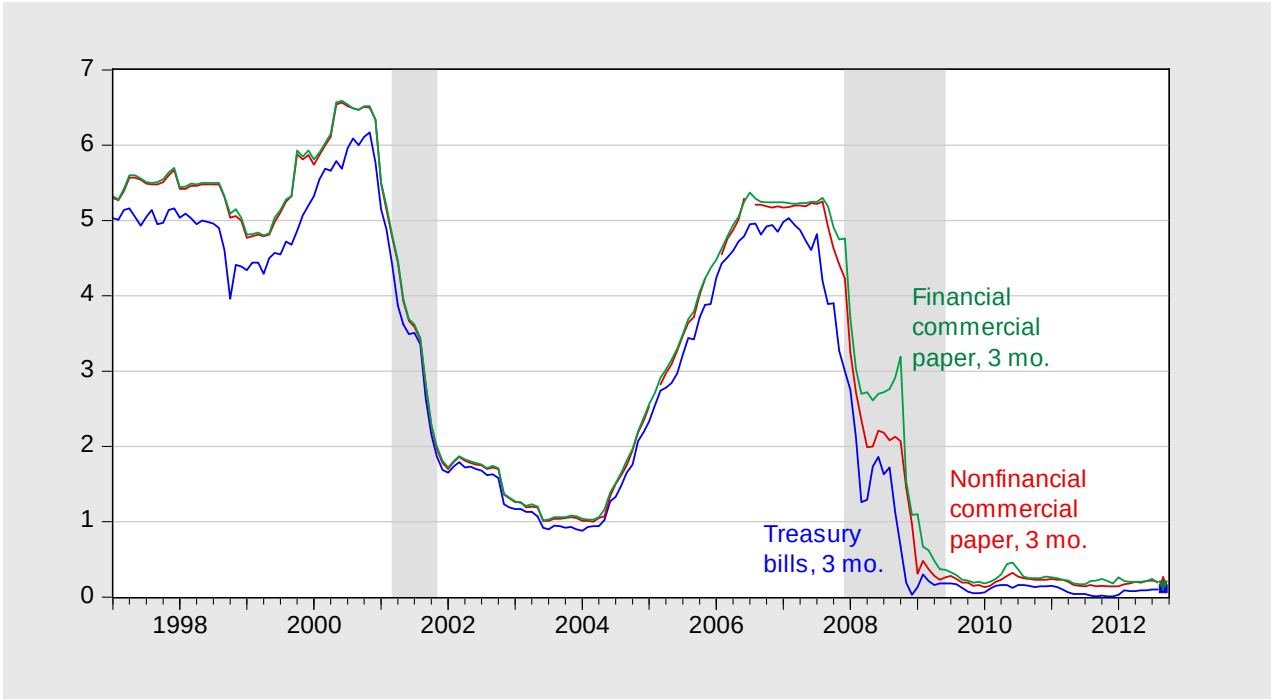
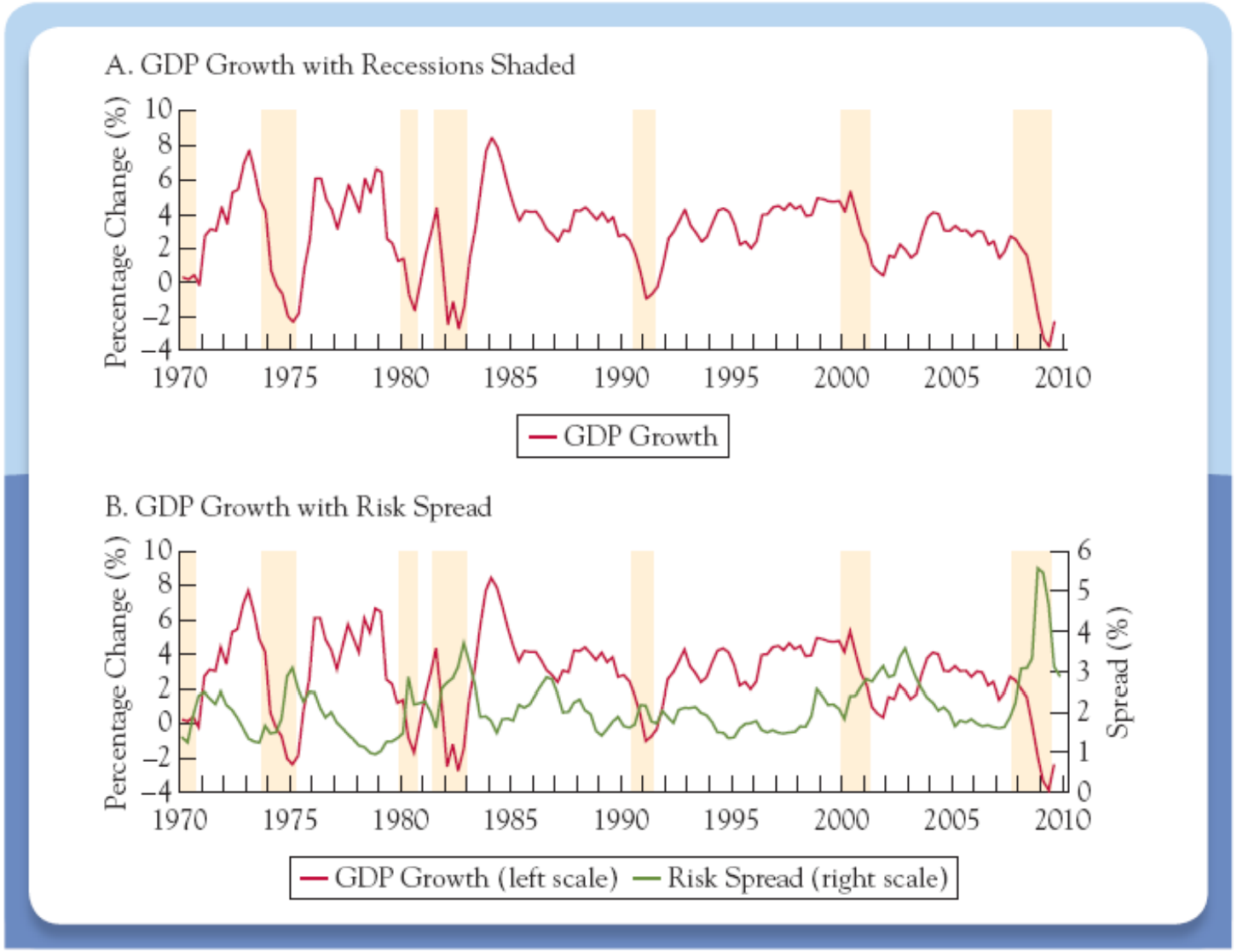

7
6
5
4
3
2
1
0
Financial
commercial
paper, 3 mo.
Nonfinancial
commercial
paper, 3 mo.
Treasury
bills, 3 mo.
1998
2000
2002
2004
2006
2008
2010
2012

Figure 7.8 The Risk Spread and GDP Growth



The Impact of Ratings on Yields

- Changes in the U.S. Treasury yields account for most of the movement in the Aaa and Baa bond yields.
- From 1979-2009, the 10-year U.S. Treasury bond yield has averaged almost a full percentage point below the average yield on Aaa bonds and two percentage points below the average yield on Baa bonds.

LESSONS FROM THE CRISIS
ASSET-BACKED COMMERCIAL PAPER

- Asset-backed commercial paper (ABCP) is a short-term liability with a maturity of up to 270 days.
  - ABCP is collateralized by assets that financial institutions place in a special portfolio.
- These played a special role in the housing boom that preceded the financial crisis of 2007-2009.

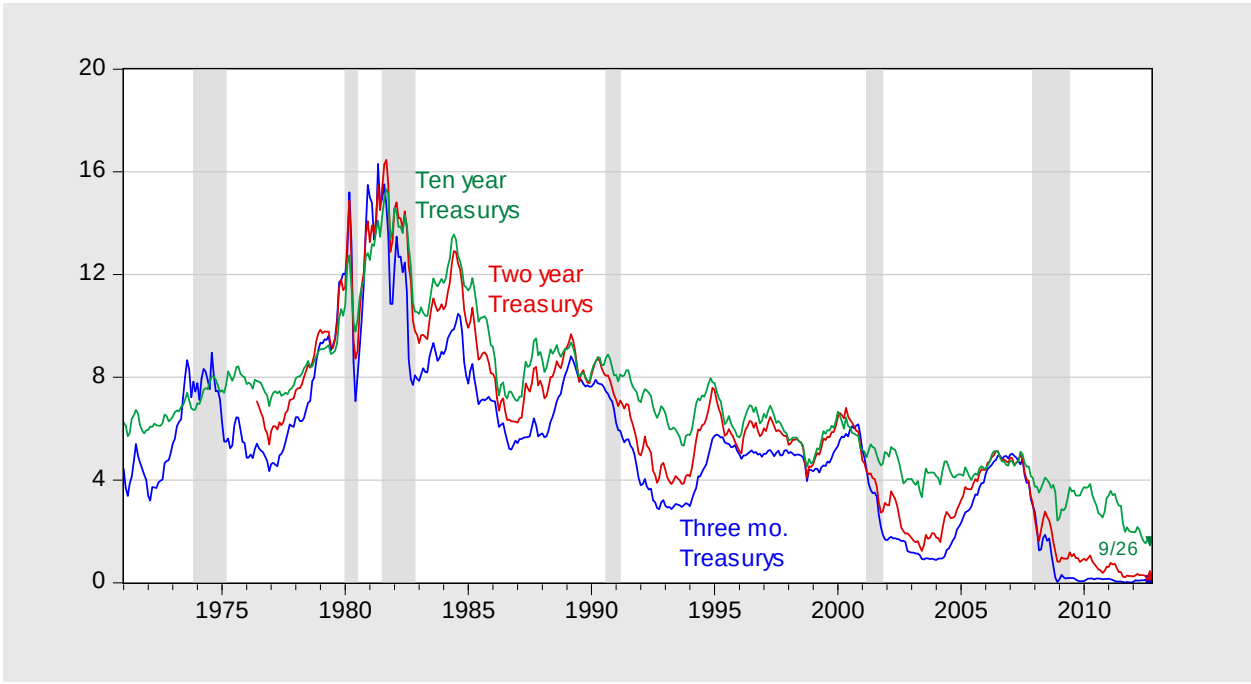
- To lower costs and limit asset holding, some large banks created firms (a form of shadow bank) that issued ABCP and used the money to buy mortgages and other loans.
  - The payment stream generated by the loans was used to compensate the holders of the ABCP.
  - This also allowed banks to boost leverage and take on more risk.
  - When mortgage volume surged, these shadow banks issued more ABCP to finance expansion.

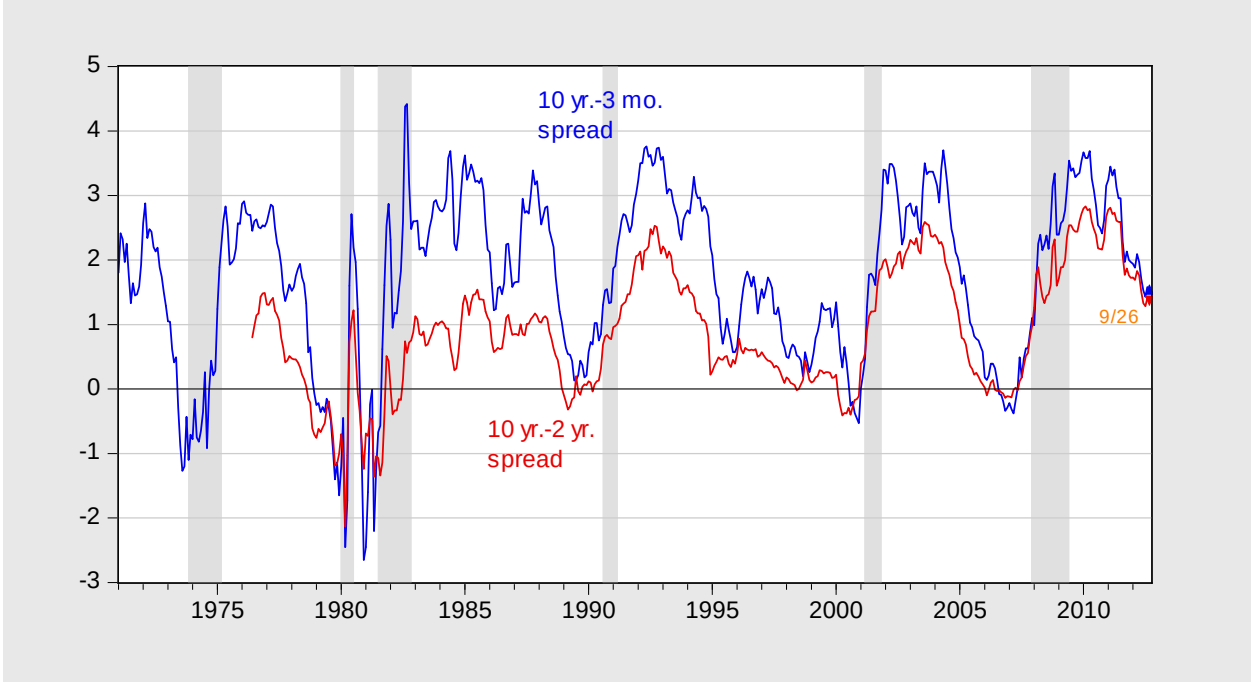
- When the ABCP matures, issues have to borrow (or sell underlying assets) to be able to return the principal to the ABCP holders.
- The risk was that the issuers would be unable to borrow - they faced *rollover* risk.
- If they were also unable to sell the long-term assets easily, the shadow banks would face failure.

- The uncertainty in the value of mortgages lead ABCP purchasers to realize the risk and ABCP purchases halted.
- Firms that has issued ABCP faced an immediate threat to their survival.
  - Inability to sell assets or obtain other funding caused many to fail.
  - Some banks rescued their shadow banks, facing heightened liquidity needs and pressures to sell assets during the worst time

Term Structure of Interest Rates

- Why do bonds with the same default rate and tax status but different maturity dates have different yields?
  - Long-term bonds are like a composite of a series of short-term bonds.
  - Their yield depends on what people expect to happen in the future.
- How do we think about *future interest rates*?


20
16
12
8
4
0
Ten year
Treasurys
Two year
Treasurys
Three mo.
Treasurys
9/26
1975
1980
1985
1990
1995
2000
2005
2010


5
4
3
2
1
0
-1
-2
-3
10 yr.-3 mo.
spread
10 yr.-2 yr.
spread
9/26
1975
1980
1985
1990
1995
2000
2005
2010

EHTS: Math

If agents are risk neutral.

$$P_{1t} = \frac{\$100}{1+i_{1t}} \qquad (1)$$

$$P_{2t} = \frac{\$100}{(1+i_{1t})(1+i^{e}_{1t+1})} \qquad (2)$$

If both one year and two year bonds offer the same one-year return (by arbitrage), then:

$$1+i_{1t} = \frac{P^{e}_{1t+1}}{P_{2t}} \qquad (3)$$

Rearranging:

$$P_{2t} = \frac{P^{e}_{1t+1}}{1+i_{1t}} \qquad (4)$$

What is the numerator of the right hand side of (4)? Iterating (1) forward, and taking expectations:

$$P^{e}_{1t+1} = \frac{\$100}{1+i^{e}_{1t+1}}$$

This can be substituted into (4) to obtain:

$$P_{2t} = \frac{\$100}{(1+i^{e}_{1t+1})(1+i_{1t})} \qquad (5)$$

No Arbitrage

We know in fact:

$$P_{2t} = \frac{\$100}{(1+i_{2t})^2} \tag{6}$$

What will set (5) equal to (6)?

$$\frac{\$100}{(1+i_{2t})^2} = P_{2t} = \frac{\$100}{(1+i^e_{1t+1})(1+i_{1t})}$$

Which implies:

$$(1+i_{2t})^2 = (1+i^e_{1t+1})(1+i_{1t})$$

$$(1+2i_{2t}+{i_{2t}}^2) = (1+i^e_{1t+1}+i_{1t}+i^e_{1t+1}i_{1t})$$

$$2i_{2t} \approx i^e_{1t+1} + i_{1t}$$

$$\boxed{i_{2t} \approx \frac{1}{2}(i^e_{1t+1} + i_{1t})} \tag{7 [7.4]}$$

$$i^e_{1t+1} = 2i_{2t} - i_{1t} \tag{8}$$

In general:

$$\boxed{i_{nt} = \frac{(i_{1t} + i^e_{1t+1} + \ldots + i^e_{1t+n-1})}{n}} \tag{9 [7.6]}$$

The Expectations Hypothesis

Figure 7.5 The Expectations Hypothesis and Expectations of Future Short-term Interest Rates

$$i_{nt} = \frac{(i_{1t} + i^{e}_{1t+1} + \ldots + i^{e}_{1t+n-1})}{n}$$

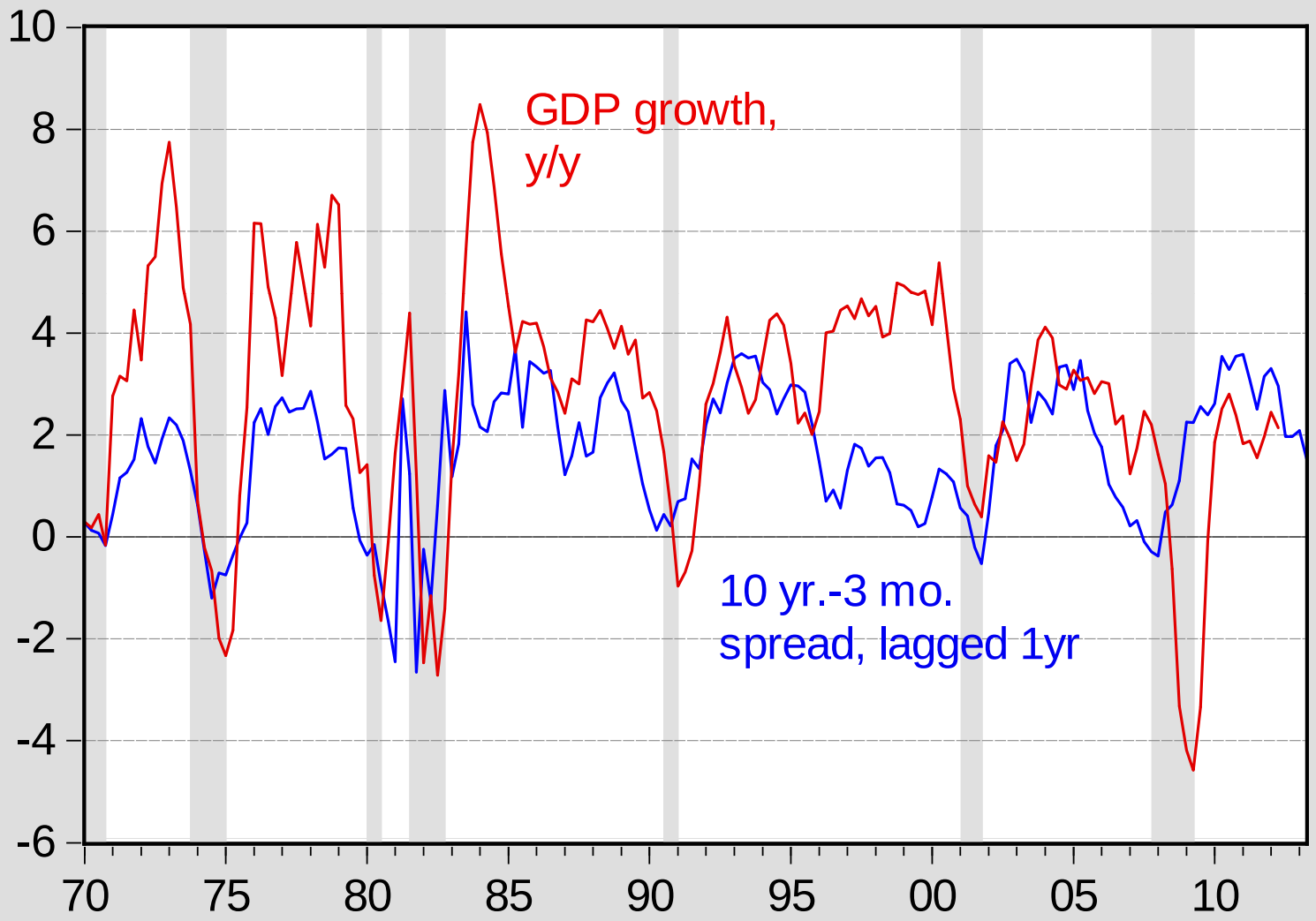
Liquidity Premium Theory

The linkage between the long-term and short-term interest rates can be decomposed thus:

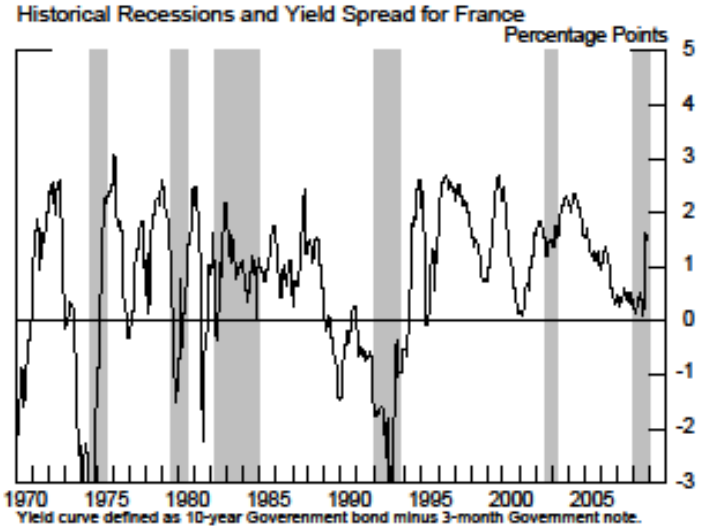
$$i_{nt} = \frac{(i_{1t} + i^{e}_{1t=1} + ... + i^{e}_{1t+n-1})}{n} + rp_{nt} \qquad (10)\ [7.7]$$

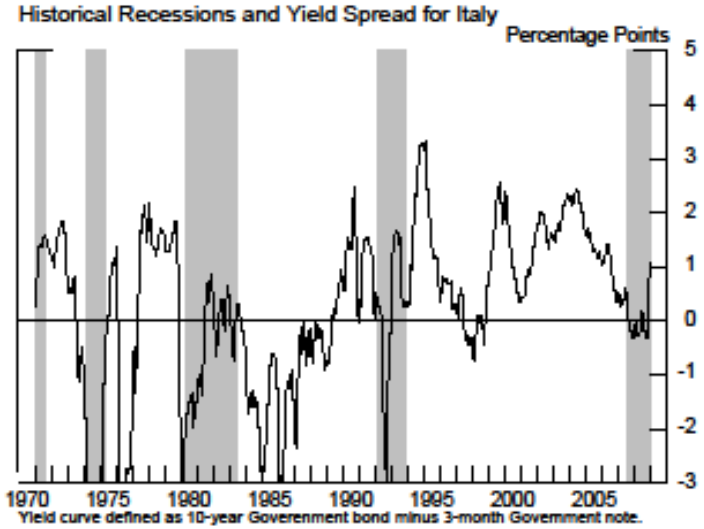
Where i_{nt} is the interest rate on a bond of maturity n at time t, i^{e}_{1t+j} and is the expected interest rate on a one period bond for period $t + j$, based on information available at time t, and rp_{nt} is the liquidity (or term) premium for the *n*-period bond at time t. This specification nests the expectations hypothesis of the term structure (EHTS) (corresponding to the first term on the right hand side of equation 10), and the liquidity premium theory (corresponding to the second term).

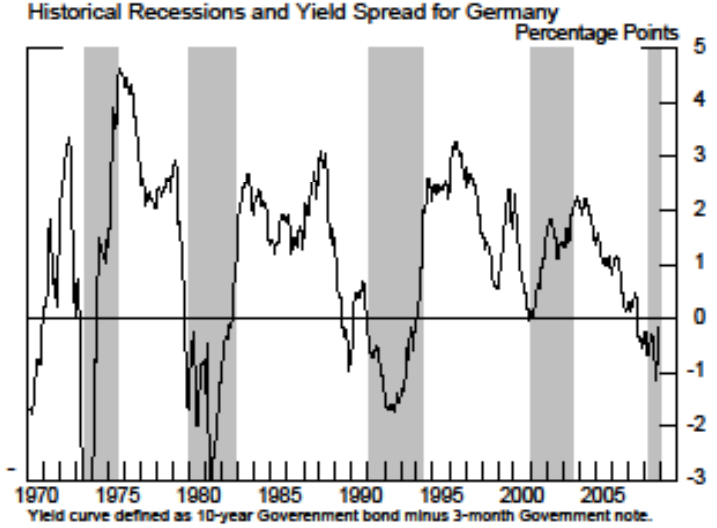
Term Spread and GDP Growth



Cross-Country Spreads







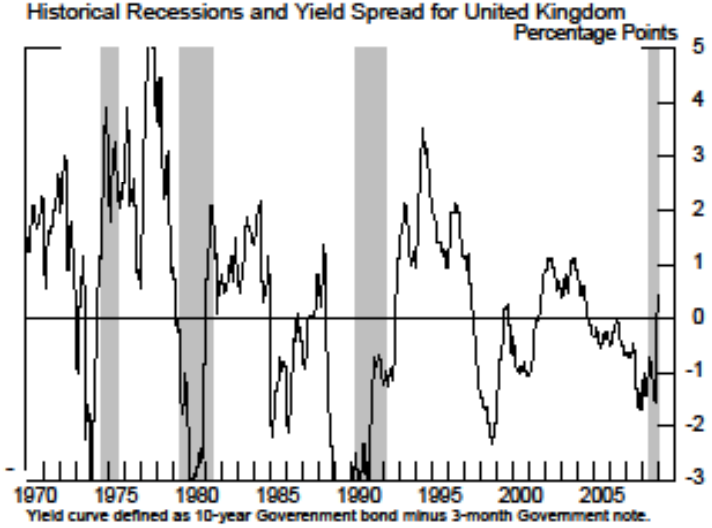


Table 1: Yield Curve/Growth Recessions, Full Sample (1970-2009)

	Constant	Slope	Constant	Slope
Canada	0.208	**1.854**	**0.954**	**1.212**
	0.532	0.209	0.420	0.180
France	0.271	**1.383**	0.998	**0.527**
	0.554	0.338	0.372	0.200
Germany	0.075	**1.416**	0.623	**1.006**
	0.634	0.259	0.372	0.137
Italy	**1.273**	**0.871**	**1.567**	-0.025
	0.629	0.300	0.402	0.178
Japan	1.333	**1.299**	**1.983**	0.297
	0.762	0.391	0.553	0.286
Netherlands	0.173	**0.946**	**0.655**	**0.482**
	0.526	0.246	0.244	0.117
Sweden	1.021	**0.746**	**2.178**	-0.061
	0.710	0.263	0.545	0.212
U.K.	0.620	**0.882**	**0.781**	**0.604**
	0.403	0.207	0.285	0.113
US	-0.037	**1.630**	0.362	**1.456**
	0.628	0.289	0.442	0.190

Table 3: Yield Curve/Growth Recessions, Late Sample (1998-2009)

	1 Year		2 Year	
	Constant	Slope	Constant	Slope
Canada	-1.138	1.066	-0.812	0.933
	1.696	0.705	1.556	0.708
France	-4.091	**2.923**	**-2.693**	**2.016**
	2.148	1.237	1.334	0.739
Germany	-4.147	**5.055**	-1.855	**3.123**
	1.742	1.743	1.708	1.055
Italy	**-4.955**	**3.451**	-1.930	1.259
	2.429	1.462	1.750	0.926
Japan	-8.507	7.063	0.925	-0.447
	6.627	4.730	2.367	1.575
Netherlands	-0.846	1.386	0.177	0.625
	2.022	1.335	0.849	0.545
Sweden	**-7.126**	**5.915**	-2.472	2.678
	3.262	2.045	2.557	1.395
U.K.	-0.753	0.808	**-0.730**	0.013
	0.409	0.832	0.319	0.454
United States	0.058	0.316	-0.611	**1.090**
	0.988	0.485	0.843	0.311

Table 8: Probit Model Performance

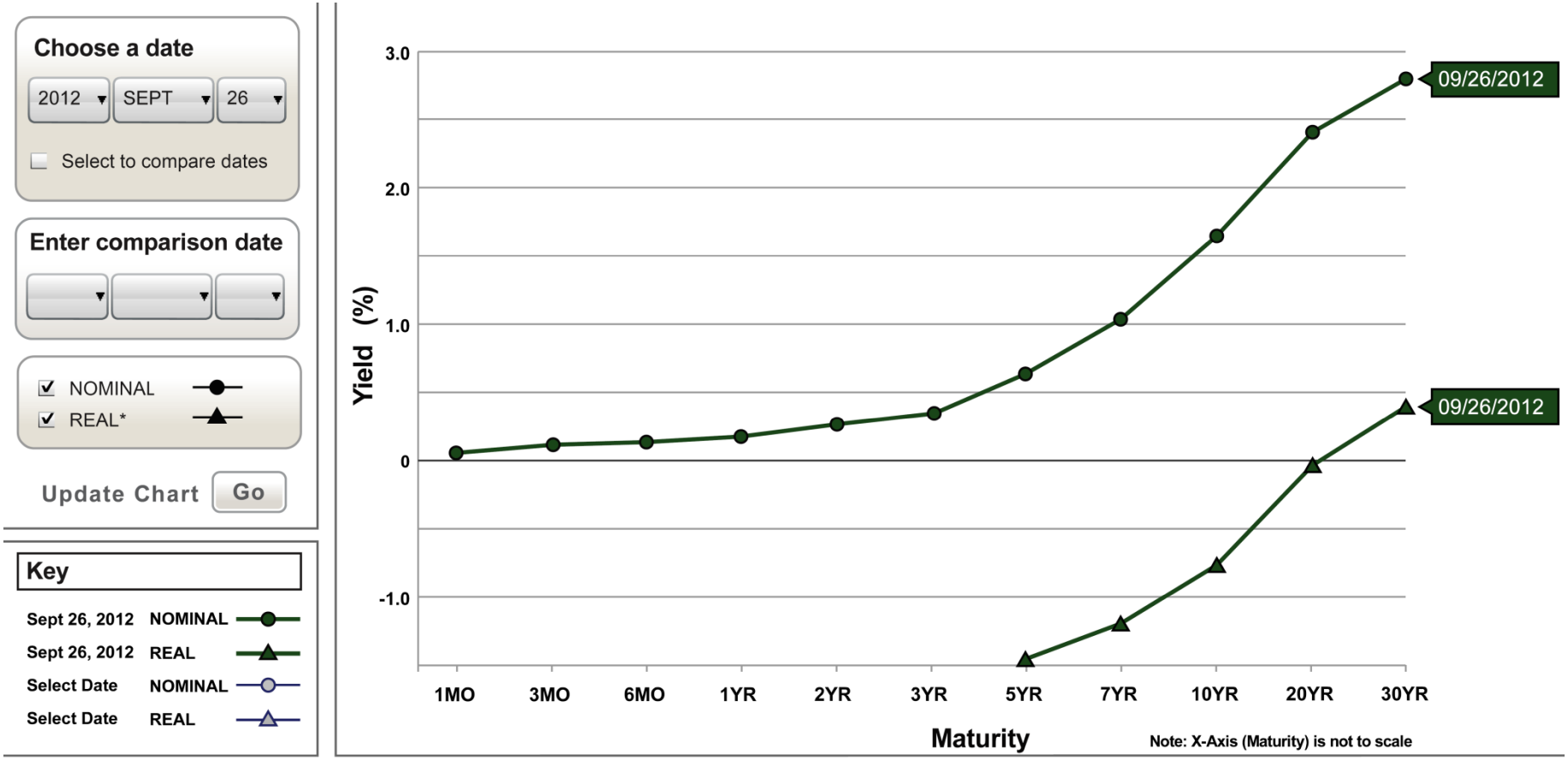
	Next 6 Months		Next 12 Months	
Canada				
10 yr-3 mo	**-0.526**	-0.064	**-0.606**	-0.140
	(0.104)	(0.133)	(0.127)	(0.182)
3 mo		**0.317**		**0.345**
		(0.083)		(0.097)
Pseudo R2	0.307	0.480	0.354	0.533
France				
10 yr-3 mo	**-0.351**	-0.219	**-0.402**	**-0.269**
	(0.088)	(0.110)	(0.115)	(0.136)
3 mo		0.100		0.102
		(0.058)		(0.063)
Pseudo R2	0.100	0.146	0.117	0.163
Germany				
10 yr-3 mo	**-0.647**	**-0.541**	**-0.602**	**-0.480**
	(0.148)	(0.199)	(0.159)	(0.201)
3 mo		0.083		0.102
		(0.098)		(0.110)
Pseudo R2	0.324	0.332	0.286	0.299
Italy				
10 yr-3 mo	**-0.256**	-0.152	**-0.202**	-0.111
	(0.081)	(0.105)	(0.091)	(0.124)
3 mo		0.059		0.052
		(0.040)		(0.048)
Pseudo R2	0.087	0.119	0.054	0.087
Japan				
10 yr-3 mo	-0.047	**-0.715**	-0.013	**-0.633**
	(0.088)	(0.156)	(0.113)	(0.170)
3 mo		**-0.371**		**-0.352**
		(0.074)		(0.091)
Pseudo R2	0.003	0.241	0.000	0.225
Sweden				
10 yr-3 mo	**-0.286**	-0.123	**-0.290**	-0.147
	(0.109)	(0.131)	(0.126)	(0.154)
3 mo		**0.125**		0.111
		(0.053)		(0.067)
Pseudo R2	0.105	0.163	0.106	0.154
United Kingdom				
10 yr-3 mo	**-0.254**	-0.117	**-0.300**	-0.178
	(0.118)	(0.128)	(0.137)	(0.152)
3 mo		**0.176**		**0.184**
		(0.069)		(0.079)
Pseudo R2	0.099	0.238	0.130	0.273
United Sates				
10 yr-3 mo	**-0.433**	**-0.341**	**-0.652**	**-0.573**
	(0.110)	(0.125)	(0.143)	(0.154)
3 mo		0.092		0.121
		(0.078)		(0.110)
Pseudo R2	0.139	0.163	0.252	0.284

Predicting Recessions

- Negative coefficient predicted (dummy = 1 for recession)
- Sometimes need the short term rate
- Works best for US, Japan, Germany

TreasuryYield Curve: 9/26/2012

http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/Historic-Yield-Data-Visualization.aspx



The Current Situation