Increase in Default Risk on Corporate Bonds

Corporate Bond Market
1. \(RET^c\) on corporate bonds \(\uparrow\), \(D^c\) \(\downarrow\), \(D^c\) shifts left
2. Risk of corporate bonds \(\uparrow\), \(D^c\) \(\downarrow\), \(D^c\) shifts left
3. \(P^c\) \(\downarrow\), \(i^c\) \(\uparrow\)

Treasury Bond Market
4. Relative \(RET^c\) on Treasury bonds \(\uparrow\), \(D^T\) \(\uparrow\), \(D^T\) shifts right
5. Relative risk of Treasury bonds \(\downarrow\), \(D^T\) \(\uparrow\), \(D^T\) shifts right
6. \(P^T\) \(\uparrow\), \(i^T\) \(\downarrow\)

Outcome:
Risk premium, \(i^c - i^T\), rises

Corporate Bonds Become Less Liquid

Corporate Bond Market
1. Less liquid corporate bonds \(D^c\) \(\downarrow\), \(D^c\) shifts left
2. \(P^c\) \(\downarrow\), \(i^c\) \(\uparrow\)

Treasury Bond Market
1. Relatively more liquid Treasury bonds, \(D^T\) \(\uparrow\), \(D^T\) shifts right
2. \(P^T\) \(\uparrow\), \(i^T\) \(\downarrow\)

Outcome:
Risk premium, \(i^c - i^T\), rises
Risk premium reflects not only corporate bonds’ default risk, but also lower liquidity
Tax Advantages of Municipal Bonds

Municipal Bond Market
1. Tax exemption raises relative RET on municipal bonds, \( D^m \uparrow \), \( D^m \) shifts right
2. \( P^m \uparrow \), \( i^m \square \)

Treasury Bond Market
1. Relative RET on Treasury bonds \( \square \), \( D^T \square \), \( D^T \) shifts left
2. \( P^T \square \), \( i^T \uparrow \)
Outcome:
\( i^m < i^T \)

Term Structure Facts to be Explained
1. Interest rates for different maturities move together
2. Yield curves tend to have steep slope when short rates are low and downward slope when short rates are high
3. Yield curve is typically upward sloping

Three Theories of Term Structure
1. Expectations Theory
2. Segmented Markets Theory
3. Liquidity Premium Theory
   A. Expectations Theory explains 1 and 2, but not 3
   B. Segmented Markets explains 3, but not 1 and 2
   C. Solution: Combine features of both Expectations Theory and Segmented Markets Theory to get Liquidity Premium Theory and explain all facts
Expectations Hypothesis

Key Assumption: Bonds of different maturities are perfect substitutes.

Implication: \( RET \) on bonds of different maturities are equal.

Investment strategies for two-period horizon:
1. Buy $1 of one-year bond and when it matures buy another one-year bond.
2. Buy $1 of two-year bond and hold it.

Expected return from strategy 2 is approximately \( 2(i_{2t}) \).

Expected return from strategy 1 is approximately \( i_t + \bar{r}_{t+1} \).

From implication above expected returns of two strategies are equal: Therefore

\[ 2(i_{2t}) = i_t + \bar{r}_{t+1} \]

Solving for \( i_{2t} \):

\[ i_{2t} = \frac{(i_t + \bar{r}_{t+1})}{2} \]

More generally expected return from strategy 1 for \( n \)-period bond:

\[ i_n = \frac{(i_t + \bar{r}_{t+1} + \bar{r}_{t+2} + ... + \bar{r}_{t+(n-1)})}{n} \]

In words: Interest rate on long bond = average short rates expected to occur over life of long bond.

Numerical example:
One-year interest rate over the next five years 5%, 6%, 7%, 8% and 9%.

Interest rate on two-year bond:

\[ (5\% + 6\%)/2 = 5.5\% \]

Interest rate for five-year bond:

\[ (5\% + 6\% + 7\% + 8\% + 9\%)/5 = 7\% \]

Interest rate for one to five year bonds:

5%, 5.5%, 6%, 6.5% and 7%.

Expectations Hypothesis and Term Structure Facts

Explains why yield curve has different slopes:
1. When short rates are expected to rise in future, the average of future short rates = \( i_n \) is above today’s short rate: therefore the yield curve is upward sloping.
2. When short rates are expected to stay the same in future, the average of future short rates is the same as today’s, and the yield curve is flat.
3. Only when short rates are expected to fall will the yield curve be downward sloping.

Expectations Hypothesis explains Fact 1 that short and long rates move together:

1. Short rate rises are persistent.
2. If \( i_t \) ↑ today, \( \bar{r}_{t+1}, \bar{r}_{t+2} \) etc. ↑ □ average of future rates ↑ □ \( i_n \) ↑.
3. Therefore: \( i_t \) ↑ □ \( i_n \) ↑, i.e., short and long rates move together.

Explains Fact 2 that yield curves tend to have steep slope when short rates are low and downward slope when short rates are high:

1. When short rates are low, they are expected to rise to normal level, and long rate = average of future short rates will be well above today’s short rate: yield curve will have steep upward slope.
2. When short rates are high, they will be expected to fall in future, and long rate will be below current short rate: yield curve will have downward slope.

Doesn’t explain Fact 3 that yield curve usually has upward slope:

Short rates are as likely to fall in the future as rise, so the average of future short rates will not usually be higher than the current short rate: therefore, the yield curve will not
usually slope upward.

**Segmented Markets Theory**

**Key Assumption:** Bonds of different maturities are not substitutes at all

**Implication:** Markets are completely segmented: interest rate at each maturity is determined separately

**Explains Fact 3 that the yield curve is usually upward sloping**

People typically prefer short holding periods and thus have higher demand for short-term bonds, which have higher price and lower interest rates than long bonds

**Does not explain Fact 1 or Fact 2 because it assumes that long and short rates are determined independently**

**Liquidity Premium Theory**

**Key Assumption:** Bonds of different maturities are substitutes, but are not perfect substitutes

**Implication:** Modifies Expectations Theory with features of Segmented Markets Theory

Investors prefer short rather than long bonds — must be paid positive liquidity (term) premium, \( l_{nt} \), to hold long-term bonds

Results in the following modification of Expectations Theory

\[
i_{nt} = \left( i_t + i^e_{t+1} + i^e_{t+2} + \ldots + i^e_{t+(n-1)} \right)/n + l_{nt}
\]

Relationship Between the Liquidity Premium and Expectations Theories

**Numerical Example:**

1. One-year interest rate over the next five years:
   - 5%, 6%, 7%, 8% and 9%

2. Investors’ preferences for holding short-term bonds results in liquidity premiums for one to five-year bonds:
   - 0%, 0.25%, 0.5%, 0.75% and 1.0%.

Interest rate on the two-year bond:

\[
(5% + 6%)/2 + 0.25% = 5.75%
\]

Interest rate on the five-year bond:

\[
(5% + 6% + 7% + 8% + 9%)/5 + 1.0% = 8%
\]

Interest rates on one to five-year bonds:

5%, 5.75%, 6.5%, 7.25% and 8%.

Comparing with those for the expectations theory, liquidity premium theory produces yield curves more steeply upward sloped

**Liquidity Premium Theory: Term Structure Facts**

**Explains all 3 Facts**

Explains Fact 3 of the usual upward sloped yield curve by investors’ preferences for short-term bonds

Explains Fact 1 and Fact 2 using the same explanations as the expectations hypothesis because it states that the long rate is determined by the average of future short rates