FIXED INCOME SECURITIES

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FORWARD AND FUTURE CONTRACT

- Forward and Future are contract for a deferred delivery of an asset at a fix price, at specific time in future. Both price and time is agreed today.

Forward Contract:

- ✓ An investor who buys a forward contract, agrees to buy one unit of the underlying asset at a specified future time (Maturity Date) and a specified price

- ✓ The agreed price is set when the contract is written and the price doesn't change through the life of the contract

- ✓ If the agreed price is set such that the value of contract at time when the contract is initiated, is 0, (i.e. neither party, pays or receive anything), then the agreed price is called "Forward Price"

FORWARD CONTRACT

During the life of the contract, neither party have ANY cash flow BUT at maturity the long position receives one unit of the asset or its cash value, and pays the forward price to the seller.

Example:

Let G(t,T) be a forward price at time t ,maturing at time T. Let p(t) be the spot price of the asset at time t. The cash flow from buyer side is:

Date	Forward Price	Cash Price	Cash Flow
0	G(0,T)	P(0)	0
1	G(1,T)	P(1)	0
..			
T-1	G(T-1,T)	P(T-1)	0
T	P(T)	P(T)	P(T)-G(0,T)

FORWARD CONTRACT

- At $t_0$the value of the forward contract is 0 $(v_0 = 0)$. However as time passes, although there is no cash flow during the life of contract the value of the forward contract fluctuates, due to fluctuation of the value of the underlying asset $(v_t \geq 0 \; or \; v_t \leq$

FORWARD PRICE

$G(t,T_1,T_2)$: Forward Price at time t, maturing at T_1 on a T_2 zero-coupon bond.

V(t) is the time t value of this forward contract. No Cash Flow at time t, therefore the value of this forward contract at time 't' must be zero. We set the forward price such that the value of the contract is 0.

- $v_t = \tilde{E}_t \left[\frac{P(T_1,T_2) - G(0,T_1,T_2)}{B(T_1,s_{T_1-1})} \right] B(t,s_{t-1})$
- $v_t = \tilde{E}_t \left[\frac{P(T_1,T_2)}{B(T_1,s_{T_1-1})} \right] B(t,s_{t-1}) +$
  $G(0,T_1,T_2)\tilde{E}_t \left[\frac{1}{B(T_1,s_{T_1-1})} \right] B(t,s_{t-1})$
- $v_t = P(t,T_2,s_t) + G(0,T_1,T_2)P(t,T_1,s_t)$

FORWARD PRICE

- $v_0 = P(0, T_2, s_0) + G(0, T_1, T_2)P(0, T_1, s_0) = 0$
- $G(0, T_1, T_2) = \frac{P(0,T_2,s_0)}{P(0,T_1,s_0)}$
- Using Mimicking Portfolio:

1. Short $G(0,T_1,T_2)$ units of the T_1 maturity bond Collect
   $\$G(0,T_1,T_2) * p(0,T_1)$
2. Buy T_2 maturity Bond, pay $p(0,T_2)= G(0,T_1,T_2) * p(0,T_1)$

Note at time 0, cash Flow is $G(0,T_1,T_2) * p(0,T_1)-p(0,T_2) =0$

3. At time T_1 , you deliver the T_2 maturity Bond for the forward contract and collect $G(t,T_1,T_2)$ which is exactly your obligation from shorting $G(t,T_1,T_2)* p(T_1,T_1)$

FORWARD PRICE

Summary:

1. To find the forward price at time t, $G(t,T_1,T_2)$, set the value of the forward contract to zero and solve for the forward price , using the risk-neutral expectation.

2. To find the price of time t forward contract at time m , find the value of the contract such that the forward price is G(t,T1,T2). Here we have the forward price and we need to solve for the value of the contract, where as in 1 we have to set the value of the contract to 0 and we solve for the forward price.

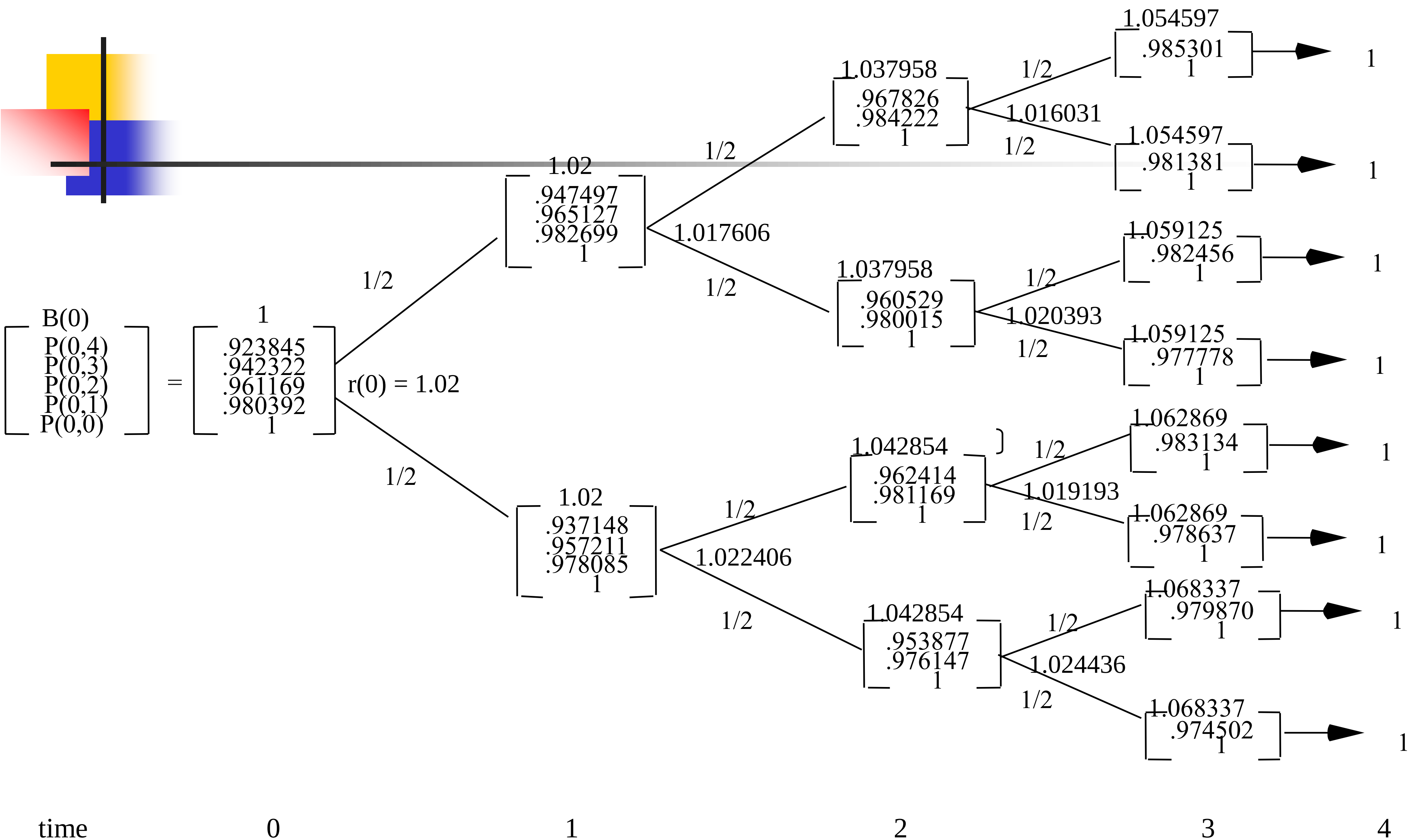


Figure 12.1: An Example of a One-Factor Bond Price Curve Evolution. The Money Market Account Values and Spot Rates are Included on the Tree. Pseudo-Probabilities Are Along Each Branch of the Tree.

Example - Forward Price

F(0,3,4)= p(0,4)/P(0,3) = 0.923845 /0.942322 = 0.980392

F(1,3,4,u) = p(1,4,u)/p(1,3,u)=0.947497/0.965127= 0.981733

F(1,3,4,d) = P(1,4,u)/p(1,3,d)=0.937148/0.957211= 0.979041

F(2,3,4,uu) = P(2,4,uu)/p(2,3,uu)=0.967826/0.98422= 0.983341

F(2,3,4,ud) = P(2,4,ud)/p(2,3,ud)=0.960529/0.9800150= 0.980117

F(2,3,4,du) = P(2,4,du)/p(2,3,du)=0.9624147/0.981169= 0.980886

F(2,3,4,dd) = P(2,4,dd)/p(2,3,dd)=0.953877/0.9761470= 0.977186

Note that :

F(3,3,4,St) = P(3,4,S3)/ P(3,3,S3) =P(3,4,S3) /1

So we know the price for all forward Contracts

Example - Forward Price

- To find the forward price: $F(t,T_1,T_2)$

1) Set the value of forward contract to zero
2) Solve for forward price subject to the value of the forward contract is zero; get $F(t,T_1,T_2)$

To find the value of the time "t" forward contract at time "m" :

$$V(m,S_m)=p(m,T_2;\, S_m) - F(t,T_1,T_2)\ P(m,T1;\, S_m)$$

Here we have the forward price and we want to solve for the value of contract.

$V(1;u)=P(1,4,u) - F(0,3,4) * P(1,3;u)$

$=0.947497 - 0.980392 * 0.965127 = 0.0001294$

Example - Forward Price

$V(0)=1/1.02*E[V(1;S_1)]=$
$1/2 * 1/1.02 * V(1,u) + 1/2 *1/1.02 * V(1,d) = 0$ so $V(1,d)= -V(1,u)$

$V(3;dud)=P(3,4;dud)-F(o,3,4)* P(3,3;dud)$
$=0.978637-0.980392= - 0.001755$

$V(3,duu) = P(3,4,duu) – F(0,3,4) * p(3,3,duu)$
$= 0.983134 – 0.980392 = + 0.002742$

$V(2;du) = 1/ r(2,du) * E [v(3;S_3)| S_2=du]$
$= 1/019193 * [1/2 * (0.002742 - 0.001755)] = 0.00048175$

Future Contract

- Future contracts are like Forward contract EXCEPT they are marked to market everyday. (For every period there is a cash flow)
- As the contract matures, investor will make or receive daily installment payment toward the eventual purchase of the underlying asset, which will be at spot price of the underlying asset. The total value of daily installments and the final payment at the maturity will be equal to the future prices set when the contract was initiated.
- The daily installment is determined by the daily change in the Future price. When the future price goes up then the investor who is long will receive a payment from the investor who is short. This is called MARKING-TO-MARKET. The daily Future price is set such that the value of contract reset to 0.

Future Contract

Date	Future Price	Cash Price	Cash Flow
0	H(0,T)	P(0)	0
1	H(1,T)	P(1)	H(1,T) - H(0,T)
2	H(2,T)	P(2)	H(2,T) - H(1,T)
3	H(3,T)	P(3)	H(3,T) - H(2,T)
…			
T-2	H(T-2,T)	P(T-2)	H(T-2,T) - H(T-3,T)
T-1	H(T-1,T)	P(T-1)	H(T-1,T) - H(T-2,T)
T	P(T)	P(T)	P(T) - H(T-1,T)

FUTURE PRICE

Future price is marked to market, that is in every period there is a cash flow, to reset the value of Future contract to 0. The cash flow is such that at each state of the world the value of the future contract is 0 . The value of each state depends not only on the final payoff , but the value of the future contract the next period, you will either receive or pay cash. We need to use the back-ward induction technique.

$H(t,T_1,T_2)$: The future price at time t , maturing at time T_1 , on a T_2 zero coupon bond.

$H(T_1-1,T_1,T_2)$ is a one period future price.

FUTURE PRICE

$$0 = \overset{\cong}{E}_{T_1-1}\left[\frac{p(T_1,T_2) - H(T_1-1,T_1;T_2)}{B(T_1)}\right] \times B(T_1-1)$$

$$H(T_1,T_1;T_2) = p(T_1,T_2)$$

$$0 = \overset{\cong}{E}_{T1-1}\left[\frac{p(T_1,T_2) - H(T_1-1,T_1;T_2)}{1}\right] \times \frac{B(T_1-1)}{B(T_1)}$$

$$H(T_1-1,T_1;T_2) = \overset{\cong}{E}_{T_1-1}\left[p(T_1,T_2)\right] = \overset{\cong}{E}_{T_1-1}\left[H(T_1,T_1,T_2)\right]$$

$$0 = \overset{\cong}{E}_{T_1-2}\left[\frac{H(T_1-1,T_1;T_2) - H(T_1-2,T_1;T_2)}{B(T_1-1)}\right] \times B(T_1-2)$$

$$+ (\overset{\cong}{E}_{T_1-2}\left[\frac{H(T_1,T_1;T_2) - H(T_1-1,T_1;T_2)}{B(T_1)}\right] \times B(T_1-2))$$

the second term is zero!

$$H(T_1-2,T_1,T_2) = \overset{\cong}{E}_{T_1-2}\left[H(T_1-1,T_1,T_2)\right]$$

$$H(t,T_1,T_2) = \overset{\cong}{E}_t\left[p(T_1,T_2)\right]$$

The future price is the time t expectation of the underlying T_2- maturity zero-coupon bonds' price trading at time T_1

Example-Future Price

H(3,3,4;uuu)=p(3,4,uuu)=0.985301

H(3,3,4;uud)=p(3,4,uud)= 0.981381

H(2,3,4;uu)=E[H(3,3,4,uu?)]= ½ * [0.985301+ 0.981381]=0.983341

- Cash flow at state uuu = 0.985301-0.983341= + 0.001960
- Cash flow at state uud = 0.981381-0.983341= - 0.001960

What would the mimicking portfolio look like?

M(2,uu)*B(3,uuu)+N1(2,uu)* P(3,4,uuu) =
M(2,uu)*1.05459 + N1(2,uu)*0.985301 = + 0.001960

M(2,uu)*B(3,uud)+ N1(2,uu)*P(3,4,uud) =
M(2,uu)*1.05459 + N1(2,uu)*0.981381 = - 0.001960

So N1(2,uu) = 1   M(2,uu) = - 0.932439

Example-Future Price

- Another method:

From delta:

$$N1(2,\text{uu}) = \frac{\text{cashflow}\,(3,\text{uuu}) - \text{cashflow}\,(3,\text{uud})}{P(3,4,\text{uuu}) - P(3,4,\text{uud})} = \frac{2*0.00196}{0.985301 - 0.981381} = 1$$

$$H(0,3,4) = \overset{\cong}{E}[\,p(3,4,S_3)] = \pi\,(s_3 = uuu) \times P(3,4,\text{uuu})$$

$$+\pi\,(s_3 = uud) \times P(3,4,\text{uud}) + \ldots + \pi\,(s_3 = ddu) \times P(3,4,\text{ddu}) + \pi\,(s_3 = ddd) \times P(3,4,\text{ddd})$$

$$= \frac{1}{8}\begin{bmatrix} 0.985301 + 0.981381 + 0.982456 + 0.97778 \\ + 0.983134 + 0.978637 + 0.979870 + 0.974502 \end{bmatrix} = 0.980383$$

Relation of Forward and future price

We can now use the theory of the preceding sections to relate forward and futures prices.

$$G\left(t,T_1,T_2\right)=\frac{\tilde{E}_t\left(\frac{P\left(T_1,T_2\right)}{B(T_1)}\right)}{\tilde{E}_t\left(\frac{1}{B(T_1)}\right)}$$

$$H\left(t,T_1,T_2\right)=\tilde{E}_t\left(P\left(T_1,T_2\right)\right)$$

$$H\left(t,T_1,T_2\right)=\tilde{E}_t\left(\frac{P\left(T_1,T_2\right)}{B(T_1)}\right)\frac{B(t)}{P(t,T_1)}$$

Relation between Forward and future price

COV(x,y)=E[(x-E(x)) * (y-E(y))] =

E[xy]-E[x E(y)]- E[y E(x)]+ E[E(x) E(y)]

= E [xy] – E[x] E[y]= COV(x,y) , E [xy] = COV(x,y) + E[x] E[y]

$$G\left(t,T_1,T_2\right)=\tilde{E}_t\left(P\left(T_1,T_2\right)\right).\tilde{E}_t\left(\frac{1}{B(T_1)}\right)\frac{B(t)}{P(t,T_1)}+COV\left[(P(T_1,T_2),\frac{1}{B(T_1)}\right]\times\frac{B(t)}{P(t,T_1)}$$

$$G(0,T_1,T_2)=\frac{\tilde{E}_0\left(\frac{P\left(T_1,T_2\right)}{B(T_1)}\right)}{\tilde{E}_0\left(\frac{1}{B(T_1)}\right)}=\frac{\tilde{E}_0\left(P\left(T_1,T_2\right)\right)\times\tilde{E}_0\left(\frac{1}{B(T_1)}\right)+COV\left[(P(T_1,T_2),\frac{1}{B(T_1)}\right]}{\tilde{E}_0\left(\frac{1}{B(T_1)}\right)}$$

Relation between Forward and future price

$$G(0,T_1,T_2)=\tilde{E}_0\Big(P\big(T_1,T_2\big)\Big)+COV\left[(P(T_1,T_2),\frac{1}{r_0\times r_1\times..\times r_{T-1}}\right]\times\frac{1}{P(T_1,T_2)}$$

$$G(0,T_1,T_2)=H(0,T_1,T_2)+COV\left[(P(T_1,T_2),\frac{1}{r_0\times r_1\times..\times r_{T-1}}\right]\times\frac{1}{P(T_1,T_2)}$$

So if interest rates goes up , $\frac{1}{r_0\times r_1\times..\times r_{T-1}}$ Goes down

If interest rate goes up , $P(T_1,T_2)$ Goes down

Cov (,) >0 , then G(0,T1,T2) > H(0,T1,T2) , which means when covariance is positive then forward price exceeds future prices.

Options on Futures

European call option T* < T_1 exercise K ,

You are entitled to buy a future contract with excersie price of $H(T^*,T_1,T_2)$ at K .

Payoff = Max($H(T^*,T_1,T_2)$-k ,0)

$$C(t,S_t)=E_t[\frac{Max(h(T^*,T_1,T_2)-k,0)}{B(T^*,S_{t^*-1})}]B(t,S_{t-1})$$

K=0.981 H(2,3,4)

C(2,uu)= Max(0.983341 – 0.981 , 0) = 0.002341

C(2,ud) = Max (0.980117 – 0.981 , 0) = 0

C(2,du) = Max (0.980886- 0,981 , 0) = 0

C(2,dd) = Max (0.977186 – 0.981 , 0) =0

Options on Futures

- C(1,u) = 1 / (2*1.017606) * 0.002341= 0.001150
- C(1,d) =0
- C(0) = ½ * 1/ 1.02 * 0.001150 = 0.00564

To ways to hedge:

1) Use the underlying Asset

$$N_1(1,u) = \frac{C(2,uu) - C(2,ud)}{P(2,4,uu) - P(2,4,ud)} = \frac{0.02341 - 0}{0.967826 - 0.960529} = 0.3208$$

$$N_0(1,u) = \frac{C(1,u) - N1(1,u)\,p(1,4,u)}{B(1)} = \frac{0.001150 - 0.3208 * 0.947497}{1.02} = -0.29686$$

2) use the future contract

$$\overset{\approx}{N}_1(1,u) = \frac{C(2,uu) - C(2,ud)}{\text{cash flow}(2,\text{uu}) - \text{cash flow}(2,\text{ud})} = \frac{0.02341 - 0}{0.001612 - (-.001612)} = 0.726117$$

$$\overset{\approx}{N}_0(1,u) = \frac{C(1,u) - \overset{\approx}{N}1(1,u) \times 0}{B(1)} = \frac{0.001150}{1.02} = 0.01127$$

EURODOLLAR FUTURE CONTRACT

- Eurodollar deposits are deposits that are maintained outside the United states. Generally they are exempt from federal Reserve regulation that applied to the domestic deposits.

- The rate that are applied to Eurodollar deposits in Interbank transaction are known as London Interbank Offered Rates (LIBOR). The LIBOR spot is active in maturities ranging from few days to 10 years. The depth of the market is great at 3 months and six month maturates.

- The Eurodollar future contracts trades at Merc in Chicago. the contract settles to 90 days LIBOR , which is the yield derived from the underlying asset that is the 90-day Eurodollar time deposit.

EURODOLLAR FUTURE CONTRACT

- Each contract is for $1 million face value of euro deposits, with delivery each month for several months in the future, after which the delivery occurs only in quarterly periods (March , June , September and December) . Currently the market is for up to 10 years in the future

- Future contracts settles by cash , on the maturity date. On expiration which is the second London business day before the third Wednesday of the maturity month, the contract settles by cash to LIBOR
- How?

EURODOLLAR FUTURE CONTRACT

- On Expiration date the clearing house determines the three month LIBOR, by selecting at random 12 reference banks from a list of no less than 20 participating banks, and asks for their three months LIBOR rate.
- Then the highest and lowest quotes are eliminated and the average of the remaining rates are calculated. The final settlement price is 100-Average LIBOR.
- Margin Requirement

  An investor has to set up margin as a security deposit. Exchange will set a minimum margin requirements , but each trading house will set their own margin requirements. Currently for Eurodollars future contract the margin requirement is around $2,000. Most clearing house accept a very high percentage of the margin as interest bearing securities such as T-bils .

EURODOLLAR FUTURE CONTRACT- Margin

- In addition to the initial margin, we also have a maintenance margin which is set around 75-80% of the initial margin. This is how the maintenance margin works:

- Suppose we bought a June 02 Eurodollar future at 97.47 (this is to say that in June 02 ,the three months LIBOR is 2.53%) . We set up the initial margin of $2000 for our contract. Now we know each thick is equivalent to basis point move in the interest rate and is equal to $25. The minimum price fluctuation is 0.5 basis points or $12.50.

EURODOLLAR FUTURE CONTRACT- Margin

- Now the maintenance margin for this is \$1500, so if the future interest rates goes up by 20 basis point from 2.53% to 2.73% the future price will fall from 97.47 to 97.27 . If on any day the final settlement price falls at or below 97.27 , which will result in a loss of \$500 or more, and we hit the maintenance margin, the exchange will call us and ask us for an additional cash to bring the account balance to \$2000 again.

- If the customer can not meet the margin call, the brokerage house will sell the position and give whatever is left to the customer.

EURODOLLAR FUTURE CONTRACT

- From Eurodollar contracts we can obtain the yield curve
- Important factor:

1. Actively traded for wide range of maturity , up to seven years.
2. Contract is heavily used for hedging and synthesizing interest rate swaps

What is Swap?

Assume that I have floating rate liabilities index of 90-day LIBOR . From Dec 2002 , through 2010.Now if I sell all the future Eurodollar contract. I converted all the floating rate liabilities into a stream of currently known liabilities.

EURODOLLAR FUTURE CONTRACT- Swap

- Example:

If the LIBOR on March 2005 where 7%. Now I am locking in the rate of 6.18%. My liabilities on my loan is : 0.82% higher than what I lock in.

0.82*$1,000,000*1/4

On the other hand I am making :

100-7=93 , 100-6.18 =93.82

93.820-93=0.82*250,000

So I swap my floating liabilities into known liabilities.

EURODOLLAR FUTURE CONTRACT- Swap rate

- Swap rate:
- The discount weighted average of the short term Eurodollar rates:

$$x \times [p(0,T_1) + p(0,T_2) + \ldots + p(0,T_n)] = r(T_1)p(0,T_1) + r(T_2)p(0,T_2) + \ldots + r(T_n)p(0,T_n)$$

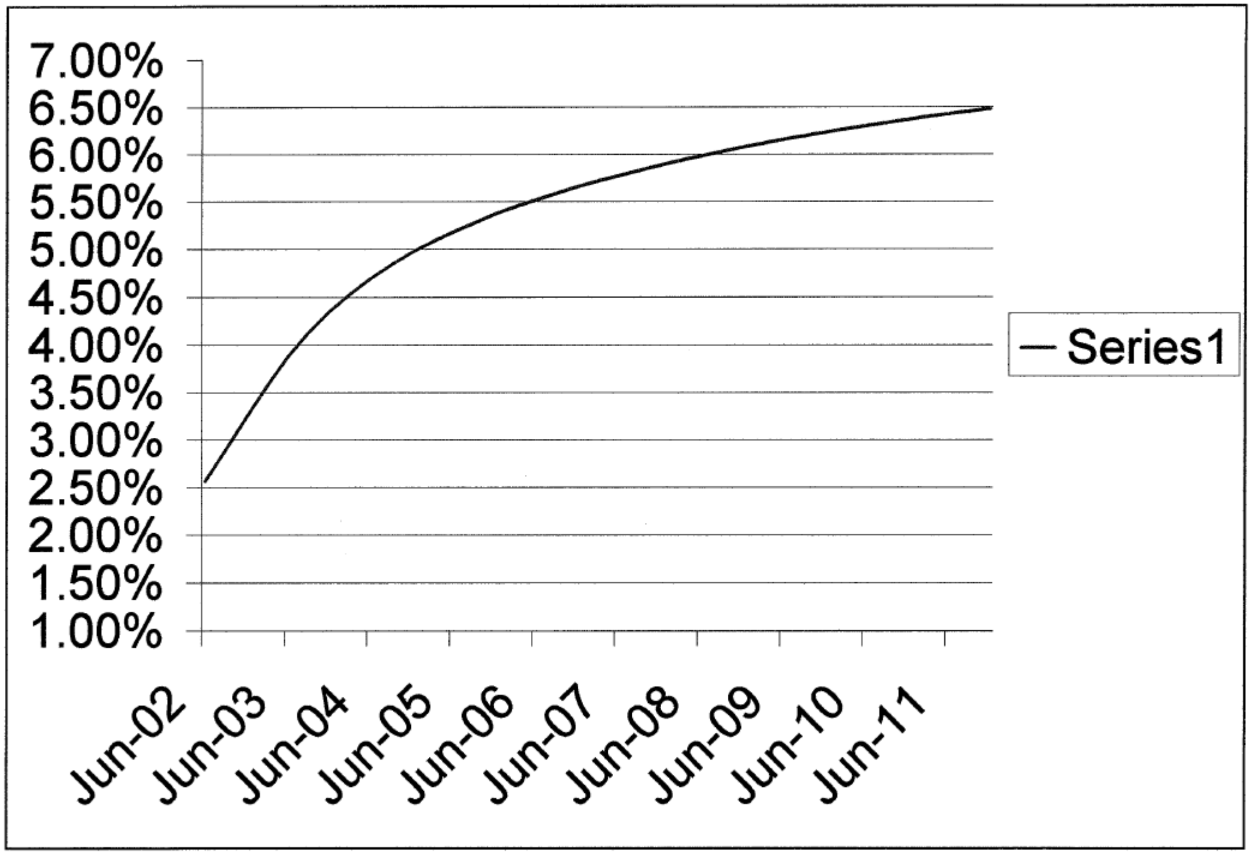
$$x = \frac{r(T_1)p(0,T_1) + r(T_2)p(0,T_2) + \ldots + r(T_n)p(0,T_n)}{p(0,T_1) + p(0,T_2) + \ldots + p(0,T_n)}$$

For following slide data, the numerator is 164.90 , and the denominator is 29.538 or the swap rate is 5.583%

	YTM	Forward		Zero-Coup
Jun-02	2.56%	2.54%	0.99365	0.99365
Sep-02	2.90%	3.20%	0.99201	0.98571
Dec-02	3.24%	3.87%	0.99033	0.97618
Mar-03	3.57%	4.50%	0.98875	0.96519
Jun-03	3.87%	4.99%	0.98753	0.95315
Sep-03	4.13%	5.32%	0.98671	0.94049
Dec-03	4.35%	5.56%	0.98611	0.92743
Mar-04	4.53%	5.72%	0.98571	0.91418
Jun-04	4.70%	5.87%	0.98533	0.90076
Sep-04	4.84%	5.99%	0.98503	0.88727
Dec-04	4.97%	6.14%	0.98465	0.87365
Mar-05	5.08%	6.18%	0.98455	0.86015
Jun-05	5.18%	6.28%	0.98431	0.84666
Sep-05	5.28%	6.35%	0.98413	0.83322
Dec-05	5.37%	6.47%	0.98383	0.81974
Mar-06	5.45%	6.47%	0.98383	0.80648
Jun-06	5.52%	6.53%	0.98368	0.79332
Sep-06	5.59%	6.59%	0.98353	0.78025
Dec-06	5.65%	6.71%	0.98324	0.76717
Mar-07	5.71%	6.71%	0.98324	0.75431
Jun-07	5.77%	6.77%	0.98308	0.74154
Sep-07	5.83%	6.82%	0.98295	0.72890
Dec-07	5.88%	6.93%	0.98269	0.71628
Mar-08	5.93%	6.91%	0.98273	0.70391
Jun-08	5.98%	6.96%	0.98261	0.69167
Sep-08	6.03%	6.99%	0.98253	0.67958
Dec-08	6.07%	7.09%	0.98229	0.66754
Mar-09	6.11%	7.06%	0.98235	0.65576
Jun-09	6.15%	7.10%	0.98226	0.64413
Sep-09	6.19%	7.12%	0.98220	0.63266
Dec-09	6.23%	7.20%	0.98199	0.62127
Mar-10	6.27%	7.17%	0.98208	0.61013
Jun-10	6.30%	7.20%	0.98201	0.59916
Sep-10	6.33%	7.22%	0.98196	0.58835
Dec-10	6.37%	7.29%	0.98178	0.57763
Mar-11	6.40%	7.26%	0.98186	0.56715
Jun-11	6.43%	7.28%	0.98180	0.55683
Sep-11	6.45%	7.30%	0.98175	0.54667
Dec-11	6.48%	7.38%	0.98156	0.53659

Sym	Expr	Open	High	Low	Last	Settle	Chg	Vol	OpenInt	Implied Rate
EDH02		92630	92630	92630				3394	437509	
EDJ02	2-Apr	97835	97845	97805	97810	97822	-12	16716	43858	2.18%
EDK02	2-May	97665	97670	97650	97650	97660	-10	6214	18346	2.34%
EDM02	2-Jun	97460	97480	97440	97450	97460	-10	113080	759996	2.54%
EDN02	2-Jul					97275			150	2.73%
EDQ02	2-Aug					97050			700	2.95%
EDU02	2-Sep	96815	96840	96785	96790	96805	-15	92686	652987	3.20%
EDZ02	2-Dec	96140	96180	96110	96115	96130	-15	80672	736481	3.87%
EDH03	3-Mar	95515	95550	95470	95475	95500	-25	68120	397381	4.50%
EDM03	3-Jun	95040	95065	94970	94975	95010	-35	28229	297133	4.99%
EDU03	3-Sep	94715	94730	94635	94640	94685	-45	26138	225923	5.32%
EDZ03	3-Dec	94475	94490	94400	94400	94445	-45	17010	180406	5.56%
EDH04	4-Mar	94320	94330	94235	94235	94285	-50	21829	132960	5.72%
EDM04	4-Jun	94150	94155	94080	94095	94130	-35	7888	125029	5.87%
EDU04	4-Sep	94020	94035	93975	93985	94010	-25	10083	109592	5.99%
EDZ04	4-Dec	93870	93885	93825	93825	93860	-35	5146	88306	6.14%
EDH05	5-Mar	93825	93845	93795	93795	93820	-25	7441	81491	6.18%
EDM05	5-Jun	93735	93745	93685	93685	93725	-40	3624	59227	6.28%
EDU05	5-Sep	93660	93670	93610	93610	93650	-40	5312	74548	6.35%
EDZ05	5-Dec	93530	93550	93490	93490	93530	-40	3948	44335	6.47%
EDH06	6-Mar	93530	93560	93500	93500	93530	-30	5656	50830	6.47%
EDM06	6-Jun	93460	93480	93450	93450	93470	-20	3008	36408	6.53%
EDU06	6-Sep	93420	93420	93390	93390	93410	-20	2349	44958	6.59%
EDZ06	6-Dec	93295	93295	93275	93275	93295	-20	2428	32613	6.71%
EDH07	7-Mar	93295	93295	93255	93255	93295	-40	2397	20426	6.71%
EDM07	7-Jun					93230		640	15164	6.77%
EDU07	7-Sep					93180		640	12975	6.82%
EDZ07	7-Dec					93075		640	10274	6.93%
EDH08	8-Mar					93090		640	9986	6.91%
EDM08	8-Jun	93015	93015	93015	93015	93045	-30	20	9146	6.96%
EDU08	8-Sep	92980	92980	92980	92980	93010	-30	20	8228	6.99%
EDZ08	8-Dec	92885	92885	92885	92885	92915	-30	20	3630	7.09%
EDH09	9-Mar	92910	92910	92910	92910	92940	-30	120	2801	7.06%
EDM09	9-Jun	92875	92875	92875	92875	92905	-30	110	2106	7.10%
EDU09	9-Sep	92850	92850	92850	92850	92880	-30	120	2901	7.12%
EDZ09	9-Dec	92765	92765	92765	92765	92795	-30	112	2113	7.20%
EDH10	10-Mar	92800	92800	92800	92800	92830	-30	10	3442	7.17%
EDM10	10-Jun	92775	92775	92775	92775	92805	-30	10	2478	7.20%
EDU10	10-Sep	92755	92755	92755	92755	92785	-30	10	1833	7.22%
EDZ10	10-Dec	92680	92680	92680	92680	92710	-30	10	1832	7.29%
EDH11	11-Mar	92715	92715	92715	92715	92745	-30	110	3423	7.26%
EDM11	11-Jun	92690	92690	92690	92690	92720	-30	110	1622	7.28%
EDU11	11-Sep	92670	92670	92670	92670	92700	-30	110	1869	7.30%
EDZ11	11-Dec	92595	92595	92595	92595	92625	-30	110	706	7.38%

Yield Curve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