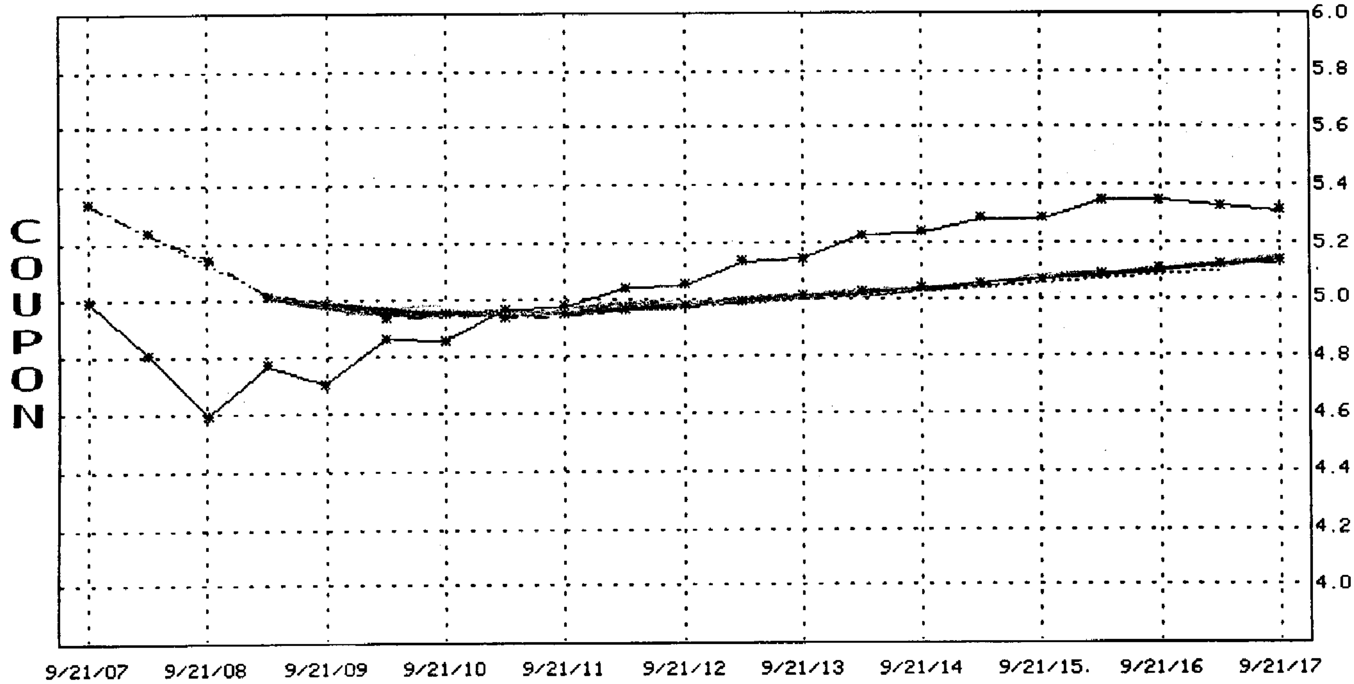
<HELP> for explanation. P141 Muni **FWCV**

IMPLIED FORWARDS CURVE
US Dollar

6-Mo Forwards 6-Mo Intervals Date 9/21/07 Points 20 Page 1/2



Forwards Curve Overlay X Spot Curve X Coupon Curve

FORWARD CURVE ANALYSIS
US Dollar

BASE CURVE DEFAULTS - BGN	
Curve Dated:	3/19/07
Settlement Date:	3/21/07
Coupon/Spot:	C
Bid/Ask/Mid:	B
FMC #	or SWDF # 23

1 GO Graph

2 GO Update Curve

3 GO Forwards Analysis

4 GO FWCM <GO>

		TERM	YIELD	12/21/07	P	3/26/07	P	9/22/08	P
		1 Wk	5.3100	4.9240	R	5.3212	R	4.6407	R
D		1 Mo	5.3200	4.9097	O	5.3208	O	4.6342	O
E	R	2 Mo	5.3400	4.8780	J	5.3415	J	4.6249	J
P	A	3 Mo	5.3500	4.8673	E	5.3475	E	4.6170	E
O	T	4 Mo	5.3441	4.8780	C	5.3412	C	4.6083	C
S	E	5 Mo	5.3400	4.8818	T	5.3362	T	4.5993	T
I	S	6 Mo	5.3350	4.8812	E	5.3296	E	4.5914	E
T		9 Mo	5.2909	4.8684	D	5.2837	D	4.6824	D
		1 Yr	5.2331	4.8488		5.2277		4.7348	
		2 Yr	5.0170	4.8183		5.0133		4.7948	
S	R	3 Yr	4.9490	4.8394		4.9465		4.8532	
W	A	4 Yr	4.9440	4.8787		4.9425		4.9084	
A	T	5 Yr	4.9640	4.9203		4.9628		4.9536	
P	E	7 Yr	5.0130	4.9976		5.0125		5.0374	
	S	10Yr	5.0990	5.0930		5.0988		5.1324	
		15Yr	5.2040	5.2094		5.2041		5.2433	
		20Yr	5.2570	5.2577		5.2570		5.2827	
		30Yr	5.2670	n/a		n/a		n/a	

SECURITY DESCRIPTION

GENERAL MOTORS GM 8 $\frac{3}{8}$ 12/07/15 92.6770/93.6770 (9.70/9.51) BGN @14:01

ISSUER INFORMATION

Name GENERAL MOTORS NOVA FIN
Type Auto-Cars/Light Trucks
Market of Issue Euro Non-Dollar

SECURITY INFORMATION

Country CA* Currency GBP
Collateral Type Company Guarnt
Calc Typ(1)STREET CONVENTION
Maturity 12/ 7/2015 Series
NORMAL
Coupon 8 $\frac{3}{8}$ Fixed
ANNUAL ACT/ACT
Announcement Dt 6/26/03
Int. Accrual Dt 7/10/03
1st Settle Date 7/10/03
1st Coupon Date 12/ 7/03
Iss Pr 99.50600Reoffer 99.506
SPR @ FPR 396.50 vs UKT 8 12/15
HAVE PROSPECTUS

IDENTIFIERS

Common 017192264
ISIN XS0171922643
BB Number ED0380714

RATINGS

Moody's Caa1
S&P B-
Fitch BB+
Composite B

ISSUE SIZE

Amt Issued/Outstanding
GBP 350,000.00 (M)/
GBP 350,000.00 (M)
Min Piece/Increment
1,000.00/ 1,000.00
Par Amount 1,000.00

BOOK RUNNER/EXCHANGE

BARCLY,GS,ML
LUXEMBOURG

1) Additional Sec Info
2) ALLQ
3) Corporate Actions
4) Cds Spreads/RED Info
5) Ratings
6) Custom Notes
7) Covenant/Default
8) Identifiers
9) Fees/Restrictions
10) Prospectus
11) Sec. Specific News
12) Involved Parties
13) Pricing Sources
14) Related Securities

65) Old DES
66) Send as Attachment

ALSO SPREAD: 375BP OVER MID-RATE SWAP. SHORT 1ST CPN.

* Canada.

SECURITY DESCRIPTION

Page 1/ 2

FORD MOTOR CO F 9.95 02/15/32 84.000/84.000 (11.98/11.98) TRAC @ 9/12

ISSUER INFORMATION	IDENTIFIERS	
Name FORD MOTOR COMPANY	CUSIP 345370BH2	1) Additional Sec Info
Type Auto-Cars/Light Trucks	ISIN US345370BH27	2) Put Schedule
Market of Issue US Domestic	BB Number 345370BH2	3) ALLQ
SECURITY INFORMATION	RATINGS	4) TRACE Trade Recap
Country US Currency USD	Moody's Caa1	5) Cds Spreads/RED Info
Collateral Type Debentures	S&P CCC+	6) Ratings
Calc Typ(1)STREET CONVENTION	Fitch B-	7) Custom Notes
Maturity 2/15/2032 Series	DBRS CCCH	8) Covenant/Default
PUTABLE	ISSUE SIZE	9) Identifiers
Coupon 9.95 Fixed	Amt Issued/Outstanding	10) Fees/Restrictions
S/A 30/360	USD 300,000.00 (M)/	11) Prospectus
Announcement Dt 2/ 3/92	USD 11,248.00 (M)	12) Involved Parties
Int. Accrual Dt 2/14/92	Min Piece/Increment	13) Issuer Information
1st Settle Date 2/14/92	5,000.00/ 5,000.00	14) Pricing Sources
1st Coupon Date 8/15/92	Par Amount 5,000.00	15) Related Securities
Iss Pr 109.7730	BOOK RUNNER/EXCHANGE	16) Issuer Web Page
	GS : goldman Sachs	65) Old DES
HAVE PROSPECTUS DTC	TRACE	66) Send as Attachment

CALLABLE UNDER SPECIAL CIRCUMSTANCES. PUTABLE 12/94. $288.402MM EXCHD FOR ISSUE W/ EXTENDED MATURITY EFF 6/4/98. SEE CUSIP#345370BW9.

Lecture 3.

- Relationship between P & Q.

ie: objective prob. Vs risk-neutral probability

- Term structure of interest rates
- def: forward rate & spot rate
- HoLi Model.

$$S \xrightarrow{p} S(H), \qquad S \xrightarrow{1-p} S(L)$$

return $= i + \lambda b$

where λ: price of risk

$1 \longrightarrow 1+i$ — i interest rate.

$$S \xrightarrow{Q} S(H), \qquad S \xrightarrow{1-Q} S(L)$$

return of all assets $= i$

$$S = B\, E_Q[S(T)]$$

Relationship between p, Q, λ:

- We saw that return of asset S is $i + a_s + b_s M$ under objective probability

with $M = \begin{cases} \sqrt{\frac{1-p}{p}} & \text{with } p \\ -\sqrt{\frac{p}{1-p}} & \text{with } 1-p \end{cases}$

$$Q = \frac{S/B - S(L)}{S(H) - S(L)} = \frac{S(1+i) - S\left(1 + a_s - b_s\sqrt{\frac{p}{1-p}}\right)}{S\left(1 + a_s + \sqrt{\frac{1-p}{p}}\right) - S\left(1 + a_s - b_s\sqrt{\frac{p}{1-p}}\right)}$$

$$Q = \frac{1+i - \left(1+i+a_s - b_s\sqrt{\frac{p}{1-p}}\right) + i}{1+i+a_s+b_s\sqrt{\frac{1-p}{p}} - \left(1+i+a_s - b_s\sqrt{\frac{p}{1-p}}\right)}$$

$$Q = \frac{-\left(a_s - b_s\sqrt{\frac{p}{1-p}}\right) + i}{b_s\left(\sqrt{\frac{1-p}{p}} + \sqrt{\frac{p}{1-p}}\right)}$$

but $\sqrt{\frac{1-p}{p}} + \sqrt{\frac{p}{1-p}} = \frac{\sqrt{(1-p)^2} + \sqrt{p^2}}{\sqrt{p(1-p)}} = \frac{1-p+p}{\sqrt{p(1-p)}} = \frac{1}{\sqrt{p(1-p)}}$

$$Q = \frac{-\left(a_s - b_s\sqrt{\frac{p}{1-p}}\right) + i}{b_s / \sqrt{p(1-p)}}$$

$$Q = \frac{-a_s\sqrt{p(1-p)} + b_s p + i\sqrt{p(1-p)}}{b_s} = \frac{b_s p - (a_s - i)\sqrt{p(1-p)}}{b_s}$$

$$Q = p - \frac{a_S - i}{b_S} \sqrt{p(1-p)}$$

$$\Rightarrow \boxed{Q = p - \lambda \sqrt{p(1-p)}} \quad \lambda : \text{market price of risk.}$$

$$X \begin{cases} a & p \\ b & 1-p \end{cases} \Rightarrow Y \begin{cases} 1 & p \\ 0 & 1-p \end{cases}$$

$E[Y] = p$

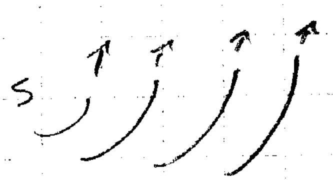
$$\begin{cases} Y = \alpha + \beta X \\ X = \alpha' + \beta' Y \end{cases}$$

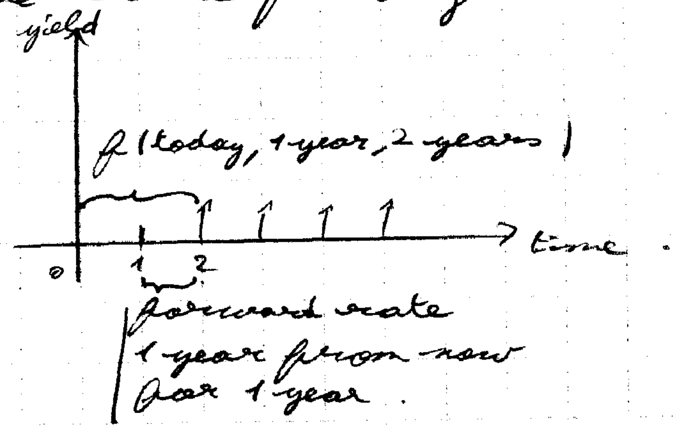
$Var[Y] = p(1-p)$

$SD(Y) = \sqrt{p(1-p)}$

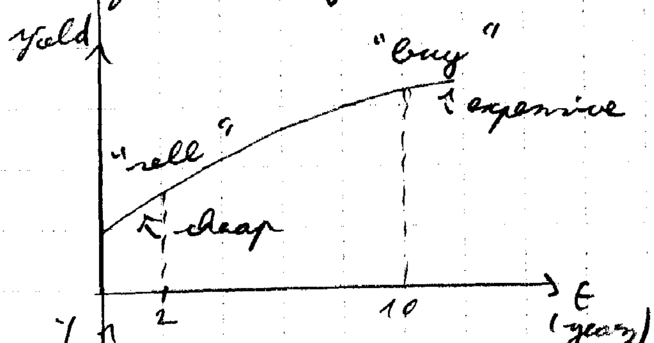
II – Interest rates

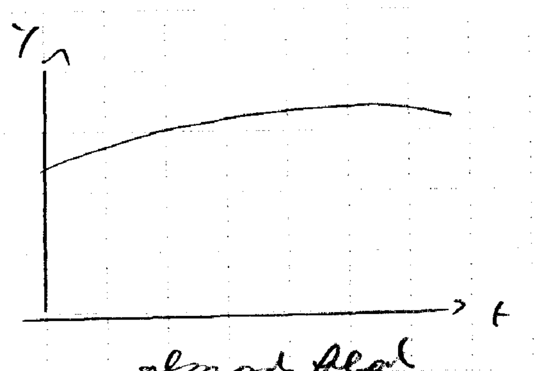
Interest rates are of at most importance in finance = Time value of money

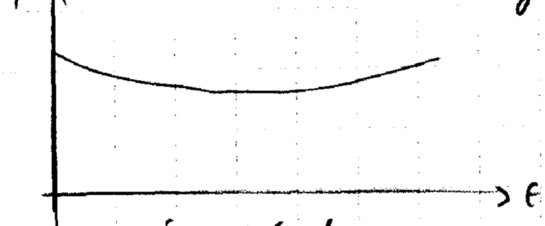




steepening rate.
flatening rate







handout : • yield curve (6 months ago)
• general motors.

rem: low rates → sell \$ → \$ weakens → inflation ↑.

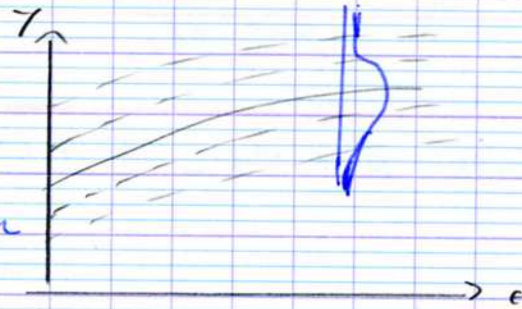
\$V01 = dollar value of 1 basis point (1bp)

≃ duration

2 : i_2 $\sum_{j=1}^{2} \frac{CF_j}{(1+i_2)^j} + \frac{100}{(1+i_2)^2}$

10 : i_{10} ↘ $\sum_{j=1}^{10} \frac{CF_j}{(1+i_{10})^j} + \frac{100}{(1+i_{10})^{10}}$: moves more is i_{10} moves.

- parallel shifts: this model is not arbitrage-free if yield curves can only be parallel.



recall: $\lim_{n\to\infty} \left(1+\frac{x}{n}\right)^n = e^x$ (related to ...)

Continuous compounding:

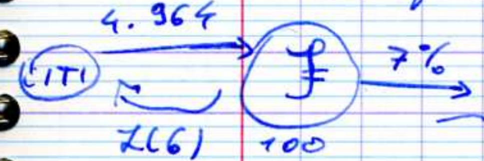
- 5% : $\frac{1}{1+0.05} = \frac{1}{1+rt}$: annually $\underset{t=0}{1} \longrightarrow \underset{1.}{1+r}$
- semi-annually : $\left(1+\frac{it}{2}\right)\left(1+\frac{it}{2}\right) = \left(1+\frac{it}{2}\right)^2$
- quarterly : $\left(1+\frac{it}{4}\right)^4$
- monthly : $\left(1+\frac{it}{12}\right)^{12}$
- every second : $\left(1+\frac{it}{n}\right)^n \xrightarrow[n\to\infty]{} e^{it}$ = continuous comp^d

with ≡ | i by years. | t in years

semi-bond 30/360 : mar. April May June Jul Aug (30, 30, ... $\frac{\#\text{ of days}}{360}$ →)

4.964 ↗ semi-bond
↘ semi-money : $\frac{\#\text{ of days rate}}{360}$
↘ $\frac{\text{actual}}{365}$
↘ $\frac{\text{actual}}{\text{actual}}$

A company needs money → issue bonds (7 %)



T : 10 years.

bonds issue by Ford.

contract between CITI & Ford ⊛

Z(6) + 7 % − 4.969 %.

pay / receive

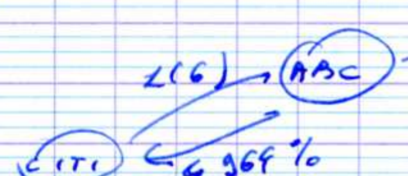
7 % / 4.969

Z(6)

if Z(6) ↘ it's good for Ford.

if Z(6) ↗ it's bad ———

⊛ interest rate swap.



⊛

PV = P(0,T) = zero-coupon bond.

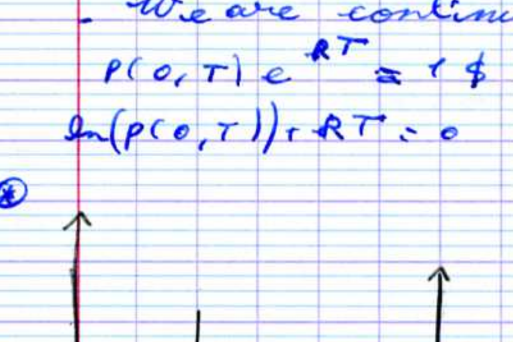
$P(1,T) = ?$

. We are continuous compounding

$P(0,T)\, e^{RT} = 1\,\$$ ⇒ $\boxed{R = -\dfrac{\ln P(0,T)}{T}} = R(0,T)$ spot rate

$\ln(P(0,T)) + RT = 0$

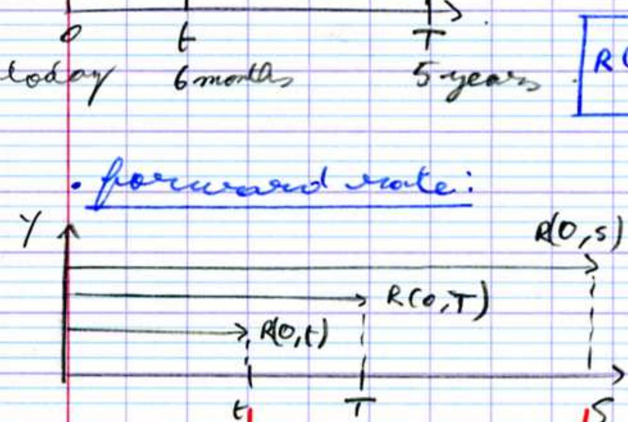
⊛



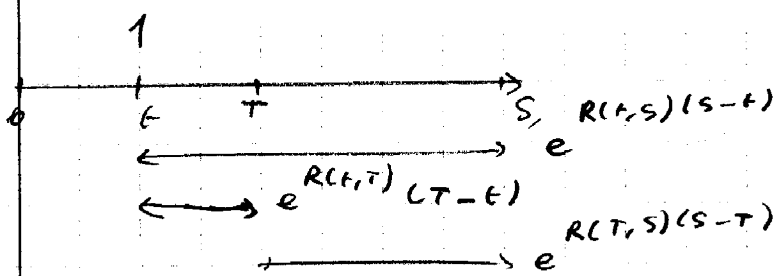
$P(t,T)$ = price of zero-coupon bond at time t that matures at T.

$\boxed{R(t,T) = -\dfrac{\ln P(t,T)}{T-t}}$ = spot rate at time t for maturity T

. forward rate:



$f(t,T,S)$ = interest rate at time t for an investment started at time T and maturity at time S



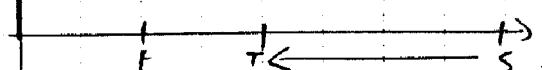
$$e^{R(t,S)(S-t)} = e^{R(t,T)(T-t)} \times e^{f(t,T,S)(S-T)}$$

$$R(t,S)(S-t) = R(t,T)(T-t) + f(t,T,S)(S-T)$$

$$R(t,S) = \underbrace{\frac{T-t}{S-t}}_{a} R(t,T) + \underbrace{\frac{S-T}{S-t}}_{1-a} f(t,T,S)$$

$$\boxed{f(t,T,S) = \frac{S-t}{S-T} R(t,S) - \frac{T-t}{S-T} R(t,T)}$$

<u>recall:</u> $R(t,T) = -\dfrac{\ln P(t,T)}{T-t}$



- consider $\lim\limits_{S \to T} f(t,T,S)$

$$f(t,T,S) = \frac{S-t}{S-T}\left(-\frac{\ln P(t,S)}{S-t}\right) - \frac{T-t}{S-T}\left(-\frac{\ln P(t,T)}{T-t}\right)$$

$$= -\frac{\ln P(t,S)}{S-T} + \frac{\ln P(t,T)}{S-T}$$

$$f(t,T,S) = -\left(\frac{\ln P(t,S) - \ln P(t,T)}{S-T}\right)$$

$$g'(x) = \lim_{\Delta \to 0} \frac{g(x+\Delta) - g(x)}{\Delta}.$$

$$g'(T) = \lim_{S \to T} \frac{g(S) - g(T)}{S-T}.$$

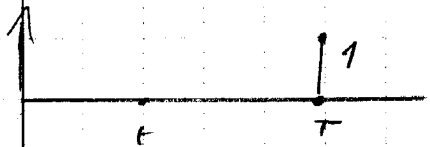
$$\Rightarrow \boxed{\lim_{S \to T} f(t,T,S) = -\frac{\partial}{\partial T} \ln P(t,T) = -\frac{P'(t,T)}{P(t,T)}} = -\frac{\frac{\partial P(t,T)}{\partial T}}{P(t,T)}$$

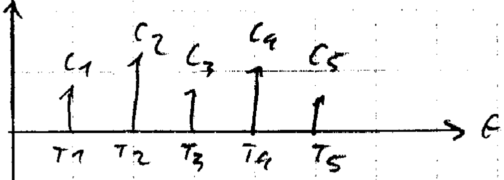
$$\Rightarrow \int_t^T f(t,T) = \int_t^T -\frac{\frac{\partial P(t,T)}{\partial T}}{P(t,T)}$$

$$\int_t^T f(t,T) = -\ln P(t,T) \Rightarrow \boxed{P(t,T) = \exp\left(-\int_t^T f(t,u)du\right)}$$

$$p(t,T) = e^{-\int_t^T r(u)\,du}$$

with $r(u) = f(t,u)$
= short rate.



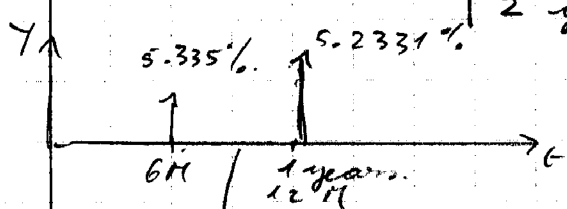


$$C_1 e^{-\int_0^{T_1} r(u)\,du} + C_2 e^{-\int_0^{T_2} r(u)\,du} + \dots$$

- Boot strapping

6 months $f(0,6,12$
12 months

2 years



$f(0,6,12)$

$$\frac{1}{1+\frac{0.05335}{2}} = e^{-r(0,6)\cdot\frac{1}{2}}$$

$$e^{-r(0,12)\cdot 1} = \frac{1}{1+0.052331}.$$

$$r(6,12) = f(0,6,12) = ?$$

$$e^{r(0,12)} = e^{r(0,6)\frac{1}{2}} \cdot e^{f(0,6,12)\cdot\frac{1}{2}} \Rightarrow \underline{\underline{f(0,6,12)}}$$