8. Dividend Discount Model of Stock Valuation

(1) $$P = \sum_{t=1}^{\infty} d_t v^t$$

↑ expected dividend at time t.

(2) $$P = \frac{d_1}{1 + i_0(0,1)} + \frac{d_2}{(1 + i_0(0,1))(1 + i_0(1,2))} + \cdots$$

↑ forward rate

(3) $$P = \frac{d_1}{1 + s_0(1)} + \frac{d_2}{(1 - s_0(2))^2} + \cdots$$

↑ spot rate.

Short Sale of Stock

Buy stock and pay full in cash → Outright purchase

Entire price is borrowed → Fully leveraged purchase.

Long position – Buy low, sell high.

(Borrow to)
Short position – Sell high, buy low (later)

(wine example).

Margin - required by investment dealer.
"good faith" money. held in account
earning interest.

Dividend - If dividend was paid during the
short sale, then seller must pay back
when closing.

Time	0	1
	Deposit Margin M	Margin grown to $M(1+i)$
	Sells Stock for S_0	Buy stock for S_1
		Pay divident D

Example 8.2

Margin : 50% of S_0. $i = 10\%$

short sale at beginning of the year.

closed at the end of the year.

Dividend of 5 is paid at the end of the year.

$S_0 = 100$.

Find net return if $S_1 = 90$.

$M = 50$.

$S_0 = 100$

$S_1 = 90$.

$i = 10\%$.

$D = 5$

$M(1+i) = 55$.

$M(1+i) + S_0 - S_1 - D$

$= 55 + 100 - 90 - 5 = 60$.

Net return earned

$$\frac{60 - 50}{50} = 20\%.$$

M.

If stock price increase during the short sales. seller might be required to add margin.

Ex 8.3

$50 per share.

Short sales 1000 shares.

Commission 2% of purchased or sold.

Margin account must maintain 40% of stock value.

No interest earned in margin account.

$$\begin{cases} S_0 = 50,000 \\ M = 20,000 \end{cases} \qquad \text{Com.} = 1000.$$

a) Suppose the stock price drops to 40. at closing

If Commission was paid from margin account.

M S_0 Com.

$20,000 + 50,000 - 1000$

S_1 Com.

$- 40,000 - 800 = 28200$

$\frac{8200}{20000} = 41\%$ net return.

b) Suppose price rize to 60.
How much does he have to add to margin account?

Stock value 60,000

40% 24,000,

needs additional 4000.

c) Suppose the stock pays dividend of 2 per share while short sales is in effect.

Find least amount by which share price must drop in order for Smith to <u>not</u> be required additional Margin.

20,000 initial margin.

$2000 dividend.

$18{,}000 - \left(\frac{100\%}{40\%}\right) = \$5{,}000$.

stock value must be below this.

$\leq \$45$.

Additional Equity Investments

Mutual Funds - group of stocks managed by professionals.

Stock Index - Av. value of group of stocks.
used as benchmark,
S&P 500, Nasdaq, Dow Jones

Exchange Traded Funds - Mutual Funds that follows particular index.
No 'expertise' needed.

Fixed Income Investments

- Bonds (Notes, bills)

  credit ratings

- CD Certificate of Deposit

- Money-Market Funds

  technically a mutual fund

  very secure

Capital Asset Pricing Model

Market risk (systematic risk)
(non-diversificable risk)

Non-Market risk (diversifiable risk)

} Assumed to be independent.

characteristic line:

$$\underset{\sim}{R_s} = \alpha_s + \beta_s \cdot \underset{\sim}{R_m} + \underset{\sim}{e_s}$$

- $\underset{\sim}{R_s}$: random return on the stock
- α_s: non-market risk
- β_s: expected change in $\underset{\sim}{R_s}$ (volatility)
- $\underset{\sim}{R_m}$: random return on the market
- $\underset{\sim}{e_s}$: random error, non-market risk, mean 0.

estimate α_s β_s by regressing historical data.

Take Expectation of both side, and get

Capital Asset Pricing Model

$$\bar{R}_s = \alpha_s + \beta_s \bar{R}_m$$

$$= R_f + \beta_s (\bar{R}_m - R_f)$$

R_f : risk-free rate of return available (eg. bond)

Bond Default and Risk Premium

Credit risk - risk that bond issuer may not meet the obligation.

Ex 8.5 Default Risk

Bond with 3 years remaining until maturity.

Estimated probability of default : 5% in any period.

Coupon rate 14%

F = 100,000.

If default occurs, no more coupon is paid, and only 50% of F will be paid at the time of default.

Use E(PV) to calculate what price should an investor pay for bond based on $i^{(2)} = 12\%$?

Period	P(default)	P(full payment t) = 1 − P(default)
1	.05	.95
2	(.95)(.05)	$(.95)^2$
3	$(.95)^2(.05)$	$(.95)^3$
4	$(.95)^3(.05)$	$(.95)^4$
5	$(.95)^4(.05)$	$(.95)^5$
6	$(.95)^5(.05)$	$(.95)^6$

Period	default	no default.
1	50,000	7000
2	50,000	7000
3	"	"
4	"	"
5	"	"
6	"	7000 + 100,000

$$E(PV) = \left[(.05)\,50{,}000 + (.95)\,7000\right] v$$

$$+ \left[(.95)(.05)\,50{,}000 + (.95)^2\,7000\right] v^2$$

$$+ \left[(.95)^2(.05)\,50{,}000 + (.95)^3\,7000\right] v^3$$

$$+ \left[(.95)^3(.05)\,50{,}000 + (.95)^4\,7000\right] v^4$$

$$+ \left[(.95)^4(.05)\,50{,}000 + (.95)^5\,7000\right] v^5$$

$$+ \left[(.95)^5(.05)\,50{,}000 + (.95)^6\,107{,}000\right] v^6$$

$$= 91\,897.18$$