

MODIGLIANI AND MILLER MODEL

1. Introduction:

- * All the previous models like Walter & Gordon has emphasised that, dividend declaration/non-declaration will necessarily affect the share price.



Both these models has dividend in its formula.

- * But, MM model, to the contrary, states that the dividend policy of the company will not affect the shareholders wealth/company's wealth.
- * As per MM model, it is the investment decision that decides the wealth of a company.



This can be understood through an example as under:

2. The example

The balance sheet of a company is as under —

| Liabilities | Amount(₹) | Assets | Amount(₹) |
|-------------|-----------|--------------|-----------|
| Equity | 10,000 | Fixed assets | 9,000 |
| Debt | 0 | Cash | 1,000 |
| | 10,000 | | 10,000 |

No. of shares = 1,000, Investment opportunity = ₹1,000



If this company want to take up an investment project, it has 2 options namely —



Option-1



Invest the cash ₹1,000 for the invest

cash of ₹1,000 will become the investment in fixed assets



P.T.O

Option-2



Declare div with cash & raise equity

cash will paid as dividend & co will issue new shares in IPO at ex-dividend price.



P.T.O

As per option-1, the share price is as under



SP before dividend = ₹10
 $\boxed{₹10,000/1,000}$

SP after investment will remain unchanged because cash becomes an asset and balance sheet & wealth will remain unchanged.

As per option-2, the share price is as under



SP before dividend = ₹10
 $\boxed{₹10,000/1,000}$

SP after dividend
Cum-div SP = ₹10
DPS = (₹1)
(₹1,000/1000)
Ex-div SP = ₹9



This SP is shared by 1,000 SH and wealth become ₹9,000 (1,000 SH x ₹9/SH)



once dividend is declared, ₹10,000 worth company will become ₹9,000 worth company. Now the SP of company is ₹9 and at this price, the company will make public issue to make investment of ₹1,000.



No. of shares to be issued = 111 shares.
(₹1000/₹9)

summary of wealth



If div is not declared



Impact on cos wealth

1,000 SH x ₹10
= ₹10,000

say, holding 10 SH

Impact on SH wealth

10 SH x ₹10
= ₹100

If div is declared



Impact on cos wealth

1,111 SH x ₹9
= ₹10,000

say, holding 10 SH

Impact on SHs wealth

SH = 10 SH x ₹9 = ₹90
Div = 10 SH x ₹1 = ₹10
Cash wealth = ₹100

* Therefore, model tries to explain that if a company has an investment opportunity, it will surely take it whether or not the dividend is declared.

* If the company distributes dividend it raises the required funds through new issue.

* This will not affect the co's wealth as ₹1000 goes out as dividend and come back as capital. The same wealth which is shared by 1000 shares will now be shared by 1,111 shares @ ₹9 SP.

* In this case (div decl), the SH experiences both joy & sorrow. Joy because he receives dividend and sorrow because, SP drops. The dividend benefit is offset by the capital loss leaving SH wealth unchanged.

Super Summary

1.

MM-model Concentrates on dividends irrelevance on the wealth of CO & SH.

2.

MM-model says that wealth of CO/SH will remain unchanged if CO has Good investment opportunity.

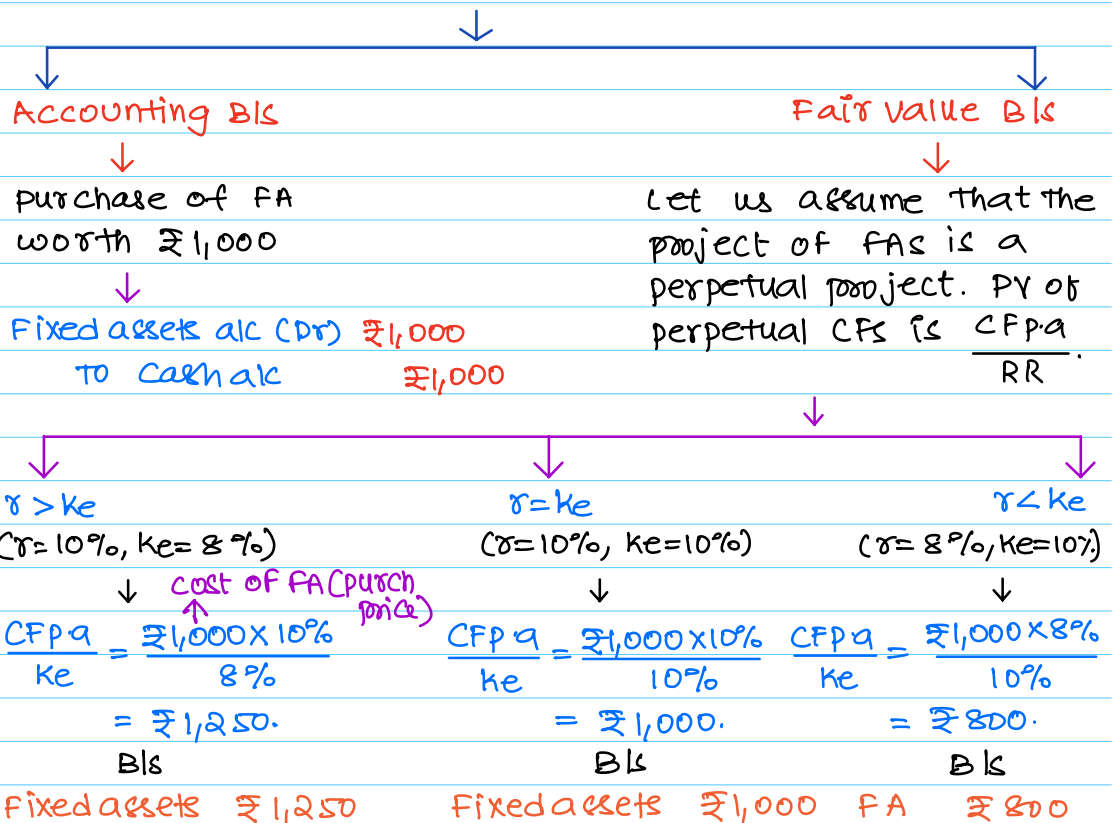
3. B/S interpretation

| Liabilities | Amount(₹) | Assets | Amount(₹) |
|-------------|-----------|--------------|-----------|
| Equity | 10,000 | Fixed assets | 9,000 |
| Debt | 0 | Cash | 1,000 |
| | 10,000 | | 10,000 |

The balance sheet shown above is not the accountancy balance sheet rather it is "Market Value" balance sheet.

A. meaning of fixed asset

- * The term fixed asset used here does not mean any individual fixed asset like Land & Building (or) P&M. It is compilation of all projects of a company which generates revenue.
- * Value of asset here represents its fair value not the historic cost (or) its book value/WDV.
- * Fair value of any asset is present value of its future CFS discounted at required rate of return.
- * Fixed asset in this example represents investments in all the projects of the company at its fair value. Let us understand difference between accounting Bk and fair value Bk on assets side.



From this one can understand that accounting focuses on costs and FM focuses on fair values.

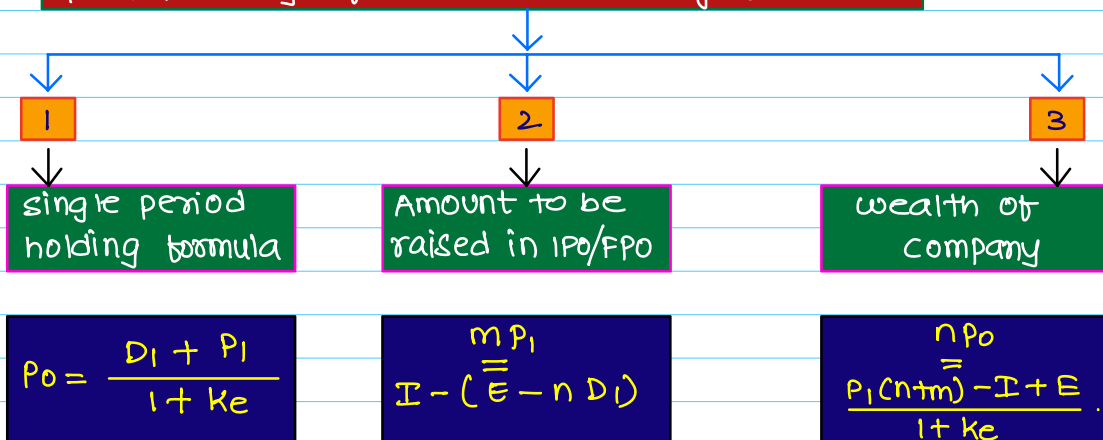
- * As per MM model, when $r = k_e$, i.e. when company gives a return exactly as what the SH expects, asset will be fairly valued at cost. This situation is called as "Good" investment opportunity.
- * If $r > k_e$, then it is called as best investment opportunity and if $r < k_e$, then it is called as "sub-standard" investment opportunity.
- * One should understand that the fair value of all the assets is called as projects and value of all projects is value of the business.
- * Therefore, value of any business is the present value of all future cash flows project is expected to generate discounted at k_e .

B. Meaning of Equity.

- * Here, in this model, the term equity is not ESC/ R&S/ both. It is fair value of equity.
- * Though people call share capital as an item of liability, in reality share capital is also an asset. The reason is, share value increases if business perform and share value fall if business doesn't perform. We have already learnt that value of business is nothing but value of projects and value of projects is nothing but value of all assets and value of asset is nothing but PV of all FCF. So, if company could not generate proper CF ($@ r > r$), then value of assets fall, eventually value of project fall and thereby value of business fall which will then impact the SP. Therefore, it is clear that, V_s is affected by value of business and share doesn't have any separate value on its own.
- * Hence, share is an asset of a kind which derives its value from value of its underlying asset called "Business".

* So, in finance world, unlike accountancy, there is no concept of Liability. Liability is just a connotation used to settle obligations. Hence, SP is just a balancing figure.

4. mm theory of irrelevance using formula.



- P_0 = Current share price
- D_1 = Dividend after 1 year
- P_1 = price after 1 year
- k_e = cost of equity
- I = Investment value
- E = Earnings
- $n D_1$ = Expected dividend amount
- $n+m$ = total shares after new issue
- n = No. of shares before new issue
- m = No. of shares to be issued.

5. Derivation / interpretation of formulae.

a. $P_0 = \frac{D_1 + P_1}{1 + k_e}$ → value of share is PV of FCF
 disc @ k_e
 ↓
 $1 + k_e$ P_0 $\frac{D_1 + P_1}{1 + k_e}$
 Div after 1 year price after 1 year.

Derivation

$$k_e = \frac{D_1}{P_0} + g \quad ; \quad g = \frac{P_1 - P_0}{P_0}$$

$$k_e - g = \frac{D_1}{P_0}, \quad k_e - \left[\frac{P_1 - P_0}{P_0} \right]$$

$$\frac{D_1}{P_0} = \frac{k_e}{1} - \frac{P_1 - P_0}{P_0}$$

$$\frac{D_1}{P_0} = \frac{P_0 k_e - P_1 + P_0}{P_0}$$

$$\frac{D_1}{P_0} = \frac{P_0 k_e + P_0 - P_1}{P_0}$$

$$D_1 = P_0 k_e + P_0 - P_1$$

$$D_1 = P_0 (k_e + 1) - P_1$$

$$D_1 + P_1 = P_0 (1 + k_e)$$

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

b. Amount to be raised from public issue

$$MP_1 = I - (E - nD_1)$$

n = no. of new shares to be issued

P_1 = Price of public issue.

That means, the amount to be raised should be equal to investment value reduced by net earnings. Net earnings means earnings available after declaring dividend.

c. Current value of company

$$P_0 = \frac{D_1 + P_1}{1 + k_e} \quad \& \quad MP_1 = I - (E - nD_1)$$

multiply LHS and RHS by n

$$nP_0 = \frac{nD_1 + nP_1}{1 + k_e}$$

Add and deduct MP_1

$$nP_0 = \frac{nD_1 + nP_1 - MP_1 + MP_1}{1 + k_e}$$

$$nP_0 = \frac{nD_1 + nP_1 - [I - (E - nD_1)] + MP_1}{1 + k_e}$$

$$nP_0 = \frac{nD_1 + nP_1 - I + E - nD_1 + MP_1}{1 + k_e}$$

$$nP_0 = \frac{nP_1 + mP_1 - I + E}{1 + k_e}$$

$$nP_0 = \frac{P_1(n+m) - I + E}{1 + k_e}$$

6. Illustrations from ISM.

Example-2

- No. of shares = 2,00,000 • MPS = ₹10 • DPS = ₹3
- $k_e = 10\%$.

Situational analysis

Dividend is
declared

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

$$₹10 = \frac{₹3 + P_1}{1 + 0.10}$$

$$P_1 = ₹8 \text{ (ex-dividend)}$$

No. of shares to be issued
to make investment of ₹6L

$$\frac{₹2,00,000 \times 3}{8} = 75,000 \text{ sh.}$$

$$\text{Market value} = 2,75,000 \text{ sh} \times ₹8$$

$$= ₹22,00,000$$

Dividend not
declared

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

$$₹10 = \frac{0 + P_1}{1 + 0.10}$$

$$P_1 = ₹11 \text{ (cum-div)}$$

Since there is no pyt of
dividend, question of
issuing new shares doesn't
arise.

$$\text{Market value} = 2,00,000 \times ₹11$$

$$= ₹22,00,000.$$

1. Given information

$K_e = 10\%$, No. of shares = 10,000, $MPS = ₹100$, $D_1 = ₹5/\text{sh.}$

Earnings available = ₹1,00,000, Investment = ₹2,00,000.

Step 1. Calculation of mps (with & without dividend)

Dividend is declared

$$P_0 = \frac{D_1 + P_1}{1 + K_e}$$

$$₹100 = \frac{₹5 + P_1}{1 + 0.10}$$

$$P_1 = ₹105.$$

Dividend not declared

$$P_0 = \frac{D_1 + P_1}{1 + K_e}$$

$$₹100 = \frac{0 + P_1}{1 + 0.10}$$

$$P_1 = ₹110.$$

Step 2 calculation of no. of shares to be raised

Dividend is declared

$$mP_1 = I - (E - nD_1)$$

$$(m \times ₹105) = ₹2,00,000 - (₹1,00,000 - 10,000 \times ₹5)$$

$$₹105m = ₹2,00,000 - ₹50,000$$

$$₹105m = ₹1,50,000$$

$$m = 1,428.57 \text{ shares.}$$

Dividend not declared

$$mP_1 = I - (E - nD_1)$$

$$(m \times ₹110) = ₹2,00,000 - (₹1,00,000)$$

$$₹110m = ₹1,00,000$$

$$m = 909.09 \text{ shares}$$

Step 3 calculation of current market value.

Dividend is declared

$$nP_0 = \frac{P_1(n+m) - I + E}{1 + K_e}$$

Dividend not declared

$$nP_0 = \frac{P_1(n+m) - I + E}{1 + K_e}$$

$$= \frac{\text{₹}105(10,000 + 1428.57) - 2,00,000 + 1,00,000}{1.10}$$

$$= \text{₹}10,00,000$$

$$= \frac{\text{₹}110(10,000 + 909.09) - 2,00,000 + 1,00,000}{1.10}$$

$$= \text{₹}10,00,000$$

∴ Value of firm remains the same across any situation.

11. Addl illustration 1: Given information

$k_e = 12\%$, No. of shares = 10,000, $MPS = \text{₹}100$, $D_1 = \text{₹}10/\text{sh.}$

Earnings available = ₹5,00,000, Investment = ₹10,00,000.

Step 1. Calculation of MPS (with & without dividend)

Dividend is declared

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

$$\text{₹}100 = \frac{\text{₹}10 + P_1}{1 + 0.12}$$

$$P_1 = \text{₹}102$$

Dividend not declared

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

$$\text{₹}100 = \frac{0 + P_1}{1 + 0.12}$$

$$P_1 = \text{₹}112$$

Step 2. Calculation of no. of shares to be raised

Dividend is declared

$$mP_1 = I - (E - nD_1)$$

$$\text{₹}102 \times m = \text{₹}10,00,000 - (\text{₹}5,00,000 - 10,000 \times 10)$$

$$\text{₹}102m = \text{₹}6,00,000$$

$$m = 5882.35 \text{ shares}$$

Dividend not declared

$$mP_1 = I - (E - nD_1)$$

$$\text{₹}112m = \text{₹}10,00,000 - (\text{₹}5,00,000 - 0)$$

$$\text{₹}112m = \text{₹}5,00,000$$

$$m = 4464.29 \text{ shares}$$

step3 calculation of current market value.

dividend is declared

$$NP_0 = \frac{P_1 (N+m) - I + E}{1+ke}$$

$$= \frac{\text{₹}102(10,000 + 5882.35) - \text{₹}10,00,000 + \text{₹}5,00,000}{1.12}$$

$$= \text{₹}10,00,000.$$

dividend not declared

$$NP_0 = \frac{P_1 (N+m) - I + E}{1+ke}$$

$$= \frac{\text{₹}112(10,000 + 4464.29) - \text{₹}10,00,000 + \text{₹}5,00,000}{1.12}$$

$$= \text{₹}10,00,000$$

Practical Problems (ISM)

(PP2) step1. calculation of mps (with & without dividend)

dividend is declared

$$P_0 = \frac{D_1 + P_1}{1+ke}$$

$$\text{₹}100 = \frac{\text{₹}5 + P_1}{1.10}$$

$$P_1 = \text{₹}105$$

dividend not declared

$$P_0 = \frac{D_1 + P_1}{1+ke}$$

$$\text{₹}100 = \frac{0 + P_1}{1.10}$$

$$P_1 = \text{₹}110.$$

step2. calculation of no. of shares to be issued

I. When dividend is declared

$$mp_1 = I - (E - ND)$$

$$\text{₹}105m = \text{₹}5,00,000 - (\text{₹}2,50,000 - \text{₹}1,25,000)$$

$$\text{₹}105m = \text{₹}5,00,000 - \text{₹}1,25,000$$

$$\text{₹}105m = \text{₹}3,75,000$$

$$m = 3,571.43 \text{ shares.}$$

II. When dividend is not declared

$$MP_1 = I - (E - nD_1)$$

$$₹110m = ₹5,00,000 - ₹2,50,000$$

$$₹110m = ₹2,50,000$$

$$m = 2,272.73$$

Step 3 Calculation of current mv of the firm.

I. When dividend is declared

$$NP_0 = \frac{P_1(n+m) - I + E}{1+k_e}$$

$$= \frac{105(28,571.43) - 5,00,000 + 2,50,000}{1.10}$$

$$= \frac{₹30,00,000 - ₹2,50,000}{1.10}$$

$$= ₹25,00,000.$$

II. When dividend is not declared

$$NP_0 = \frac{P_1(n+m) - I + E}{1+k_e}$$

$$= \frac{110(27,272.73) - 5,00,000 + 2,50,000}{1.10}$$

$$= \frac{₹30,00,000 - ₹2,50,000}{1.10}$$

$$= ₹25,00,000.$$

(PP8)

Step 1.

Calculation of mps (with & without dividend)

Dividend is
declared

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$
$$150 = \frac{8 + P_1}{1.10}$$

$$P_1 = ₹157$$

Dividend not
declared

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$
$$150 = \frac{0 + P_1}{1.10}$$

$$P_1 = ₹165$$

Step 2.

Calculation of no. of shares to be issued

I. When dividend is declared

$$mP_1 = I - (E - nD_1)$$

$$157m = ₹6,00,00,000 - (₹3,00,00,000 - ₹0,00,000)$$

$$157m = ₹6,00,00,000 - ₹2,20,00,000$$

$$157m = ₹3,80,00,000$$

$$m = 2,42,038.22 \text{ shares.}$$

II. When dividend is not declared

$$mP_1 = I - (E - nD_1)$$

$$165m = ₹6,00,00,000 - ₹3,00,00,000$$

$$m = 1,81,818.18 \text{ shares.}$$

Step 3.

Calculation of mv of company.

In this question, we are required to prove that mv of company is same across any situation at the END of year.

If dividend is paid

$$MV = 2,42,038.22 \times 157$$
$$= ₹19.50 \text{ Cr.}$$

If dividend is not paid

$$MV = 1,81,818.18 \times 165$$
$$= ₹19.50 \text{ Cr.}$$