CORPORATE TAX IN NEPAL: EFFECTIVE BURDEN (1975-2000)

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Abstract

The paper calculates and examines the effective burden of the corporate tax in Nepal over the period 1975 – 2000. The paper finds that the statutory tax rate is not the only factor that affects the burden of tax. Rather, inflation and many other variables affect the burden of tax borne by the capital income. Additionally, while the effective tax rate has gone down significantly over the last 25 years, the paper finds that the effect tax rate for debt-financed project have increased.

I. Introduction

Nepalese government has been trying to increase the rate of private investment acknowledging its importance in the development of the country. Apart from non-financial and non-tax measures, there are several tax attempts that the government has made for encouraging private sector participation in business activities. In this regard, HMG/Nepal has introduced various tax measures during the last 25 years. The examples of these tax measures are the full exemption of tax for several years to new industrial firms; full exemption of tax to export oriented industries, small scale cottage industries, agricultural industries, capital gain income etc.; provision of carry-forward of losses; treatment of preliminary expenses as fixed expenses; investment tax credit to certain types of investments and provision of liberal depreciation policies to certain types of capital expenditures; reduction in corporate tax rate. In addition, personal tax on interest has been introduced and changes in rate are made at several times; dividend tax was once introduced in 1986, dropped four years later and again introduced by 1998/99 Finance Act only for financial bodies. Depreciation system has been changed by Income Tax Rules – Income Tax Rules, 1982 and its amendment in 1992 – and

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Industrial Enterprise Acts – Industrial Enterprise Act, 1981, Industrial Enterprise Act, 1992 and first amendment of Industrial Enterprise Act, 1992 in 1997. However, despite these attempts, there is only a small contribution of industrial sector in employment generation, industrial production and GDP growth of the Nepalese economy.

Due to insufficiency of different initiatives related to tax as shown above in achieving desired objectives, a moot question about the usefulness of the above stated measures in encouraging private sector had been raised for many years in the past. In other words, there is a need of finding out whether there was real change in effective tax burden borne by capital in Nepal due to change in different tax provisions. The main technique that explains about this combined effect created by corporate tax provisions in combination of macroeconomic and many other variables are the marginal effective tax rate (ETR). Maxwell Stamp, made a survey in 1990 to analyze the then effective burden of tax prevailing at that period using this technique. But that study did not measure the time series effective tax burden using the macro economic variables. And therefore, this paper is mainly concentrated on estimating effective tax rates imposed on ordinary type of industrial corporate bodies over the period 1974/75 to 1998/99. And the purpose is to find out whether the tax environment is creating incentive or disincentive to the industrial sector in Nepal.

The methodology used to analyze the time series effective tax burden is the marginal effective tax rate technique developed during 1980s and used by most of the tax experts to compare the tax system of one country with other. Different tax experts (Auerbach and Jorgenson, 1980; Hall, 1981; King and Fullerton, 1984; Boadway, Bruce and Mintz, 1984 and 1987; Rimbaux, 1997; Graville, 1995; Jorgenson and Landau, 1993; Mintz and Sargent, 1998; Anderson, 1999 and many others) have used the concept of marginal effective tax rate in different countries to get the above stated objectives. Marginal effective tax rate is the difference between gross-of-tax required rate of return to investor and net-of-tax required rate of return to saver. The main assumption of this technique is based on the neoclassical theory of investment developed by Jorgenson (1963) where a firm goes on investing unless and until the benefit from investment equals with the revenue generated from the same. Effective tax rate does not forecast the investment behavior but it focuses on different variables of the economy that has relation with tax system creating incentive or disincentive to investor. The tax burden is not only the function of statutory rate of tax but the combined effect of different macroeconomic and other variables and tax laws. Marginal effective tax rate technique considers all these variables while calculating the effective tax burden.

The rest portions of the study are organized as methodology and data sources; presentation of effective tax burden consisting the analysis based on sources of finance, time covered, types of assets, inflation and statutory tax rate followed by the conclusion of the study.

II. Methodology and Data Sources

The calculation of effective tax rate is a tedious job. One should consider various factors directly or indirectly related to the burden of tax while calculating effective tax rates. Besides, there can be numerous effective tax rates based on different assumptions.

Table 1
Rates of Depreciation and Service Lives of Assets During 1974/75 to 1998/99 for Industrial Entities

	1974/75 to 1980/81 (1970s)	1981/82 to 1991/92 (1980s)	1992/93 to 1998/99 (1990s)
Economic Depreciation Rate (Given by Hulten and Wykoff, 1981)			
Building	.037	.037	.037
Plant and Machinery	.133	.133	.133
Furniture	.11	.11	.11
Vehicle	.27	.27	.27
Tax Depreciation Rate (St.-Line Method)			
Building	.06	.05	.022
Plant and Machinery	.10	.10	.0707
Furniture	.05	.20	.045
Vehicle	.15	.20	.097
Service Life for Tax Purpose (In years)			
Building	16.7	20	45.45
Plant and Machinery	10	10	14.14
Furniture	20	5	22.22
Vehicle	6.67	5	10.30

Source: Compiled from different sources.
Note: Tax depreciation rate for 1990s is accelerated rate i.e., after considering the additional 1/3 of the rate given in Income Tax Rules, 1982 with first amendment.

Effective tax rate can be expressed in two ways – in terms of percentage points/per rupee of total return or total revenue of the investor and in terms of percentage of gross of tax rate of return or before tax rate of return to investor. Among these two ways of expression, the first one shows the proportion of the effective burden of tax on sales volume or total return or total revenue and is calculated by using the formula,

$$t = r_g - r_n$$

where, r_g = gross of tax required rate of return or before tax rate of return to investor and

r_n = net of tax rate of return to saver.

Correspondingly, the second one expresses the burden of tax on the basis of before tax rate of return, or taxable income of the investor and is calculated by the formula,

$$t = \frac{r_g - r_n}{r_g} \times 100$$

The detailed methodology developed for calculating effective tax rate is shown in the Appendix.

We can calculate two types of effective tax rates for the analysis – one based on individual assets and other based on aggregate. For the purpose of macroeconomic analysis, the aggregate effective tax rate is more useful than the effective tax rate based on individual assets. Considering this fact, this study is mainly focused on effective tax rate based on aggregate though the effective tax rates based on individual assets are also presented wherever possible. It should be noted here that the aggregate effective tax rate is measured on the basis of the capital stock weight of five types of fixed assets – building, Plant and machinery, furniture, vehicle and non - depreciable assets (land and stock) given by census of manufacturing establishments of Central Bureau of Statistics of HMG/Nepal.

As already stated, the period covered for the study is 25 years i.e., from 1974/75 to 1998/99. The tax depreciation rates used in the calculation are as given by the Income Tax Act, 1974; Industrial Enterprise Act, 1981 and Income Tax Rules, 1982 and Industrial Enterprise Act, 1992. Straight-line depreciation method has been used since it was the method prescribed by all income tax rules enacted during these 25 years. Although, diminishing balance method were also prescribed by Industrial Enterprise Act, 1981 and Income Tax Rules, 1982; it could not be used for this analysis because there was no provision of using diminishing balance method under the Income Tax Act, 1962. Therefore, the main reason of using straight-line method of depreciation is to maintain consistency in this respect.

Table 2
Parameters for Computation of Effective Tax Rates During 1974/75 to 1998/99

(In Percent)

Year	Interest Rate	Interest Tax Rate	Dividend Tax Rate	Corporate Tax Rate	Inflation Rate (1983/84 = 100)	Return on Equity Rate
1974/75	15	–	–	55	16.7	19
1975/76	14	–	–	60	–.59	18
1976/77	14	–	–	51	2.6	18
1977/78	14	10	–	51	11.3	16.6
1978/79	14	10	–	51	3.5	16.6
1979/80	14	10	–	50	9.7	16.6
1980/81	13	5	–	50	13.4	16.4
1981/82	13	5	–	50	10.5	16.4
1982/83	14	5	–	55	14.2	17.3
1983/84	14	5	–	55	6.3	17.3
1984/85	14	5	–	55	4.1	17.3
1985/86	14	5	–	50	15.9	17.3
1986/87	16.5	10	20	40	13.3	18.9
1987/88	15.5	5	20	40	11.1	18.7
1988/89	16.5	5	3	40	6.3	19.7
1989/90	17	5	3	40	11.5	20.2
1990/91	17	5	–	35	9.8	20.2
1991/92	18.5	5	–	35	21.1	21.6
1992/93	17	5	–	25	8.8	20.2
1993/94	15	5	–	25	9	18.3
1994/95	15.75	5	–	25	7.7	19.0
1995/96	16.25	5	–	23	8.1	19.4
1996/97	16.5	5	–	23	7.8	19.7
1997/98	15.25	5	–	20	4	18.5
1998/99	15	6	–	22	11.4	18.1

Source: Compiled from Nepal Rastra Bank and Ministry of Finance Publications.

The service-life of the asset used for tax depreciation purpose is determined by dividing 100% by the depreciation rate. The main reason of using both of these techniques in

estimating effective tax rates is one merit and one deficiency inherent in each of both the techniques. For instance, the effective tax rate based on total return is relatively less affected by the smallness in value of 'r_g' and inflation but cannot be compared with statutory tax rate. In contrast, the effective tax rate based on gross of tax required rate of return can be compared with statutory corporate tax rate but sometimes becomes unexplainable due to high variation in effective tax rate caused by smallness in value of before tax return or 'r_g' and inflation. This problem can be solved by the effective tax rates based on total return.

The industries covered for analysis are non-holiday tax paying ordinary industry under all the three sources of finance i.e., debt, mix (40% debt and 60% equity), and equity. As regards to economic depreciation rate, the methodology prescribed by Hulten and Wykoff, (1981) is followed. Return on equity is derived by adding 4% risk premium to the interest rate minus interest tax of the concerned year. Interest rate, on the other hand, is the rate of interest for industrial loan published by Nepal Rastra Bank. For the years when interest rate on industrial loan is not given, those related to working capital is used. Inflation rate for the study is based on consumer price index. Accordingly, top rates were used when there were graduated tax rates of corporate tax and interest tax. Tables 1 and 2 show the parameters that are used for calculating effective tax rates in detail. For the study assumptions are made as the Nepalese economy is small and open economy where the movement of capital is free and which do not affect the world economy but is affected by others. Other assumptions include fixed assets without salvage value, no capital gain in the value of fixed assets, no capital gain tax, the firm operating only on profit, symmetrical treatment between profit and loss of a firm by the government etc. The limitation to the study is that it has considered only the corporate tax. Value added tax, custom etc. that also become the part of the value of fixed assets are ignored.

The main data sources for this analysis are: Income Tax Act, 1974, Income Tax Rules, 1982, Industrial Enterprise Act, 1981 and Industrial Enterprise Act, 1992, Finance Acts, Quarterly Economic Bulletin of Nepal Rastra Bank, Nepal Stock Exchange Ltd., Central Bureau of Statistics etc..

III. Presentation of Effective Tax Burden

Last 25 years has been a remarkable period in the history of the corporate taxation of most of the countries of the world. In this period, the very thrust of the corporate taxation itself underwent a complete change from 'high rate high incentive' to 'low rate wide net'. In other words, concept of horizontal equity has taken the place of vertical equity. As in other countries of the world, there were substantial changes in Nepalese tax system and tax related variables too. Top marginal corporate tax rate dropped from 60% to 20% to ordinary industrial entities and 30% to other form of corporate bodies. These changes have affected

the tax burden trend in last 25 years in Nepal. The following analysis presented in Table 3 and 4 show the real tax rates under different sources of finance (debt, mix and equity), effect of inflation on effective tax rate, the comparison of effective tax rates with statutory tax rates and the comparison of asset-wise and effective tax rates in different decades i.e., 1970s, 1980s and 1990s.

As shown in Table 3, all the aggregate effective tax rates both in terms of total return and in terms of gross of tax required rate of return are positive under equity finance. As in equity finance case, the effective tax rate under mix finance is almost positive, barring the effective tax rates expressed in total return of two financial years 1974/75 and 1985/86. Contrary to the effective tax rates under equity finance and mix finance, almost all the effective tax rates under debt financing in terms of total return are negative. In other words, the effective tax rates under debt finance are almost negative, the effective tax rates under mix finance are positive but small in magnitude and the effective tax rates under equity fiancé are positive and higher than those of mix finance. The analysis shows that there is variation in effective tax rates from one source of finance to other– showing negative tax rate under debt finance and positive tax rate under mix and equity finance. The main reason of such variation in effective tax rates under different sources of finance is the deductibility of interest as expense and non-deductibility of dividend. In other words, the biasness of modern tax law in favor of debt discriminating equity is the main reason of the differences between effective tax rates under different sources finance.

As regards the trend of effective tax rates, it is known from the Tables that there is reduction in its rate for mix and equity financed project. Instead, the effective tax rates for debt -financed project have increased during 1974/75 to 1998/99. The main reason of such differences in effective tax rates is the decreasing trend in statutory tax rates. Note that higher tax rate is not only the penalty to capital income but also a reward if the financing source is debt. Especially in case of debt finance, the relation between statutory tax rates and effective tax rates are negative. In other words, whenever there is reduction in statutory tax rate there is increase in effective tax rate and vice-versa. The reason is the deductibility of interest from profit.

When analyzed past the three decades' tax rates, 1990s emerge as the period of the lowest taxed one. However, for many assets, 1970s and 1980s are almost same although 1980's tax rate is slightly below than 1970s both in terms of total return and gross of tax required rate of return. The details of aggregate effective tax rates presented in Table 4 show these facts. It is observed from Table 4 that under debt finance in terms of total return, the aggregate effective tax rates are –5.1% for 1970s, –5.2% for 1980s and –.7% for 1990s in terms of total return. This means, the tax rate under debt finance has increased. On the other hand, the tax rates under mixed finance and equity finance in terms of total return are 5.1%

and 12.2% respectively for 1970s, 2.8% and 8.4% respectively for 1980s and 2.3% and 4.3% for 1990s. This implies that tax rates in effective term have decreased substantially during last three decades.

Statutory corporate tax rate has a significant role in determining the effective tax rates. From the comparison of statutory tax rates given in Table 1 and effective tax rates given in Table 3 during the last 26 years, it can be said that under equity financing the

Table 3
Aggregate Effective Tax Rates on Different Assets with Zero and Actual Inflation Rates During 19974/75 to 1998/99

	With Zero Inflation Rate			With Actual Inflation Rate		
Year	Debt Finance	Mix Finance	Equity Finance	Debt Finance	Mixed Fin.	Equity Fin.
1974/75	–.011(–76)	.128(42)	.223(54)	–.121(88)	–.009(505)	.074(76)
1975/76	–.012(–9.4)	.148(47)	.258(59)	–.016(–14)	.142(47)	.251(59)
1976/77	–.009(–6.9)	.103(39)	.179(50)	–.023(–26)	.085(38)	.160(51)
1977/78	.005(3.8)	.100(40)	.164(50)	–.059(128)	.023(38)	.081(61)
1978/79	.005(3.8)	.100(40)	.164(50)	–.015(–19)	.076(40)	.139(51)
1979/80	.005(4.0)	.096(39)	.157(49)	–.047(261)	.033(38)	.089(56)
1980/81	–.002(–1.6)	.091(38)	.155(49)	–.073(88)	.005(25)	.061(67)
1981/82	–.003(–2.1)	.090(38)	.154(48)	–.059(148)	.022(34)	.080(58)
1982/83	–.004(–3)	.117(43)	.199(54)	–.096(91)	.003(16)	.076(71)
1983/84	–.004(–3)	.117(43)	.199(54)	–.045(–174)	.067(41)	.145(57)
1984/85	–.004(–3)	.117(43)	.199(54)	–.031(–50)	.084(42)	.164(55)
1985/86	–.002(–1.8)	.096(38)	.163(49)	–.089(78)	–.009(85)	.050(78)
1986/87	.010(6.1)	.084(34)	.134(44)	–.044(156)	.023(43)	.070(63)
1987/88	.001(.7)	.080(33)	.133(44)	–.043(689)	.030(37)	.080(56)
1988/89	.001(.9)	.077(30)	.127(40)	–.024(–35)	.047(29)	.096(42)
1989/90	.002(1)	.079(30)	.131(40)	–.046(–6895)	.025(27)	.074(47)
1990/91	.003(1.8)	.063(25)	.104(34)	–.030(–90)	.026(23)	.065(38)
1991/92	.012(7.1)	.049(21)	.073(27)	–.07(66)	–.013(54)	.026(85)
1992/93	.012(7.1)	.049(21)	.073(27)	–.010(–15)	.025(21)	.049(30)
1993/94	.011(7.1)	.044(21)	.066(27)	–.011(–27)	–.021(21)	.042(31)
1994/95	.011(7.1)	.046(21)	.069(27)	–.007(–11)	.026(21)	.048(30)
1995/96	.011(6.9)	.042(19)	.063(25)	–.007(–10)	.023(19)	.043(28)
1996/97	.012(6.9)	.043(19)	.064(25)	–.006(–8)	.024(19)	.045(27)
1997/98	.010(6.7)	.034(17)	.050(21)	.003(3)	.026(17)	.042(23)
1998/99	.012(7.8)	.038(19)	.055(23)	–.012(–73)	.013(20)	.030(31)

Note: (1) Figures in parenthesis indicate effective tax rates in percentage of gross of tax rate of turn to investor. Figures in left side of parenthesis indicate effective tax rates in percentage points/per rupee of total return.

(2) High variation in effective tax rates under debt finance is due to small value of r_g and the inflation.

Table 4
Average of Aggregate Effective Tax Rates for 1970s, 1980s and 1990s under Different Sources of Finance with Actual Inflation Rate

	Effective Tax Rates		
	1970s	1980s	1990s
Debt Finance			
Building	–.056(60)	–.056(156)	–.01(–31)
Machinery	–.029(–28)	–.030(18)	.001(–3)
Furniture	–.018(36)	–.046(–42)	.001(–1)
Non-depreciable	–.080(57)	–.083(–889)	–.017(–102)
Vehicle	–.006(6)	–.018(228)	.013(17)
Average of Aggregate	–.051(–)	–.052(–)	–.007(–)
Mix Finance			
Building	.034(26)	.018(21)	.020(17)
Machinery	.071(55)	.046(33)	.029(24)
Furniture	.092(61)	.017(15)	.031(26)
Non-depreciable	.033(57)	.007(43)	.013(12)
Vehicle	.103(64)	.060(68)	.045(33)
Average of Aggregate	–.051(–)	.028(–)	.023(–)
Equity Finance			
Building	.102(55)	.073(56)	.039(27)
Machinery	.139(64)	.101(63)	.049(31)
Furniture	.166(68)	.063(53)	.051(31)
Non-depreciable	.106(53)	.067(48)	.033(23)
Vehicle	.177(69)	.114(66)	.066(38)
Average of Aggregate	.122(–)	.084(–)	.043(–)

Note: (1) Figures in parenthesis indicate effective tax rates in percentage of gross of tax rate of turn to investor. Figures in left side of parenthesis indicate effective tax rates in percentage points of total return.

(2) 1974/75 to 1980/81 has been denoted as seventies, 1981/82 - 1991/92 as eighties and 1992/93 and after as nineties.

effective tax rate is around 51percent in comparison to the average statutory tax rate of 40.4% of these 25years. Under mixed finance, barring the very high effective tax rate of 1974/75 that occurred due to inflation, the average effective tax rate was around 33% somewhat less than the 40.4% average statutory rate. However, because of high inflation effect, it is not meaningful to compare the average effective tax rate of around 55% under debt finance with statutory rate to get meaningful answer. Table 3 also shows –6895% tax rate in 1989/90 and 689% in 1987/88. These rates are the result of small denominator value problem i.e., small r_g value problem in calculating effective tax rate. Note that whenever there is high variation in

effective tax rate, it is tax rate based on total return that gives meaning for explanation. If inflation effect is neutralized, this problem will be neutralized and the average of the effective tax rate for last 25 years become around 1% for debt finance, 32% for mixed finance and 41% for equity finance. If effective tax rates with zero inflation rates are analyzed, one can see that for debt finance project, effective tax rates have increased whereas the same have decreased for mixed finance and equity finance projects during the period. Correspondingly, in comparison to statutory tax rates, effective tax rates under equity finance are more or less equal; under mixed finance are to some extent less and under debt finance almost nonexistent. Nevertheless, the gap between effective tax rates across different sources of finance decreases gradually with the move from initial years to latter years. The main reason being the decrease in statutory corporate tax rate over the years.

The observation of the Table 4 shows that across five types of fixed assets – building, machinery, furniture, non-depreciable assets and vehicle – vehicle is the asset that is bearing highest tax burden in all the decades i.e., 1970s, 1980s and 1990s. In contrast to it, the asset bearing lightest tax burden is the non-depreciable one. The main cause for vehicle being the highest taxed asset is the differential between economic depreciation rate and tax depreciation rate being the lowest in the case of vehicles. Accordingly, furniture has been the second highest taxed asset in 1970s, lowest taxed asset in 1980s and again second highest taxed asset in 1990s. Here, tax burden of furniture has varied as per the variance in tax depreciation rate i.e., 5% in 1970s, 20% in 1980s and again 4.5% in 1990s. This also proves the statement that effective tax rate depends on tax depreciation rate and its relation with economic depreciation rate.

Although not considered by the tax system of many countries, inflation rate has impact on effective tax rate. It can be seen by comparing effective tax rates – one with zero inflation rate and other with actual inflation rate. The observation of the Table 3 shows an interesting fact that one of the main causes of the variation in effective tax rates in past in Nepal was the inflation. From the Table, it is seen that the higher the inflation rate, the higher is the variation in effective tax rates in Nepal. Furthermore, Since Nepal is an inflation prone country which has experienced -.59% to 21% inflation rates in last 25 years, we can conclude that inflation has greatly affected the effective tax rates imposed on capital income of this country. As per the Table, this effect is negative i.e. higher the inflation rate lower the effective tax rate and *vice-versa*. We can witness this effect easily by comparing effective tax rates with actual inflation effective tax rates with zero inflation given in Table 3.

IV. Conclusion

Effective tax burden is not only the function of statutory tax rate. Instead, it is a combined effect of different macro - economic variables like interest rate, inflation rate, interest tax rate, tax depreciation rate, economic depreciation rate, source of finance etc..

Nepalese policy makers reduced statutory tax rates, and changed the tax laws in past with a view of increasing investment. But there has been no worth while studies undertaken to analyze the burden of tax after these changes. The present study has tried to fulfill this lacuna. The results of the survey are: firstly, the effective tax rates have gone down significantly during these 25 years for mix and equity financed project. The effective tax rates of 1990s in comparison to 1970s are less than half. Contrary to it, the effective tax rates for debt-financed project have increased. Secondly, for debt-financed project the effective tax rates were more than statutory rate but for mix and equity financed project, they were to some extent less than that rate. Accordingly, for debt-financed project, the effective tax rates were almost negative during last 25 years. It is so because debt finance is the blessing to the firm when there is high statutory tax rate. Thirdly, inflation has caused distortion in corporate tax environment in Nepal. If there were indexation system in past, the variation in tax rate would have decreased substantially. Fourthly, among five types of assets (building, machinery, vehicle, furniture and no-depreciable asset consisting land and stock), those bearing highest and lowest burden of tax are vehicle and non-depreciable assets respectively.

The main conclusion of the study is that high statutory tax rate is not the only cause of distortion of the investment environment. Inflation and other factors as well play significant role in this respect. However, the tax environment in Nepal in terms of burden has been favourable during these 25 years i.e., 1974/75 to 1998/99 although the investment trend has not improved. The result of this study, thus, proves the findings of many researches (Coen, 1969; Eisner, 1970; Bosworth, 1985, Chirinko *et al*.1999; Bond, 1981; Goolsbee, 1998) that tax related matters have only a negligible role in increasing investment of a country.

Appendix

a. Computing Real Cost of Finance

There may be three sources of finance that can be used for generating resources to purchase the capital asset. By name, these sources are –full debt, full equity and a mix of debt and equity. Equity source itself can be bifurcated into two parts– share issues and retained earnings. Across these sources, the debt financing has certain advantages over others due to deductibility of its cost i.e., interest while calculating taxable profit. Because of the deductibility of interest, the cost of debt financing becomes to some extent less than the cost of other sources of financing. The real cost of debt, denoted by 'r_b' is given by

$$r_b = i\,(1 - u) - \pi \qquad (1)$$

where, i = interest rate, u = corporate tax rate and π = inflation rate. In this equation, i (1 – u) means tax adjusted interest rate. Inflation is deducted to find out real value instead of nominal one.

Similarly, the real cost of equity 'r_e' is denoted by

$$r_e = \rho - \pi, \qquad (2)$$

where, 'ρ' means rate of return in the form of dividend to new equity holders and in the form of both the capital gain and dividend to old equity holders.

In case of mix finance, the real cost finance is the weighted average cost of debt and equity denoted by 'r_f' that is, real cost of finance and is given by

$$r_f = \beta i\,(1 - u)\,\rho - \pi \qquad (3)$$

where, β = fraction of finance raised through debt.

b. Treatment of Depreciation

With a view of recouping the loss in the value of asset due to economic depreciation, the tax law permits the taxpayer to treat some portion of the asset value as expenditure while preparing profit and loss account. This depreciation is called tax depreciation and is denoted by 'α.The rate of this depreciation uses to be as prescribed by law. In contrast to the economic depreciation, tax depreciation is the relief to the taxpayer because it saves tax that would have been paid if there were no such provision in tax law. However, the tax authorities permit to write-off the asset value only at historical cost i.e., cost price. The implication is that the real flows of depreciation occurring in the future are worth less to the firm because of the discounting. The rate of discounting is the real cost of finance

'r_f'. By using the following perpetuity formula, one can calculate the present value of depreciation 'z' under straight-line method.

$$Z = \frac{u\alpha}{(r_f + \pi)}\left(1 - \frac{1}{(1+r_f+\pi)^T}\right) \qquad (4)$$

where, z = present value of tax saving.

Multiplying by the tax rate 'u' to present value of depreciation, the tax saving denoted by 'z' through tax depreciation 'α' can be derived.

c. Required Rate of Return to Investor 'r_g'

In an investment, investor needs some minimum amount of return. This amount is called user cost of capital. User cost of capital includes real cost of finance, economic depreciation and tax paid to the government. In this sense, the per period user cost of capital except tax saving becomes $(1 - z)(r_f + \delta)$. It is mentioned that for a marginal investment the total revenue becomes equal to its cost.

If the economic depreciation is deducted from this user cost of capital, there remains the gross of tax required rate of return to the investor 'r_g'.

$$\text{That is, } r_g = \frac{(r_f + \delta)(1-z)}{1-u} - \delta \qquad (5)$$

For a non-depreciable asset, neither the economic nor the tax depreciation is applicable. It means,

$$r_g = r_f/(1-u) \quad \ldots\ldots \qquad (6)$$

Some part of this return 'r_g' goes to saver as a return from saving denoted by 'r_n' and other part goes to tax authorities as tax denoted by 't'.

d. Required Rate of Return to Saver 'r_n'

The 'r_n' means net rate of return that really goes to the saver of the economy. 'r_n' is the sum total of two types of returns to savers - earning from debt 'r_n^b' and earning from equity 'r_n^e'. Here, it

is assumed that marginal rupee saved does not go into special tax sheltering assets and the intermediaries do not make monopoly profit. The 'r_n^b' can be calculated as follows:

$$r_n^b = i\,(1\text{-}m) - \pi, \ldots \qquad (7)$$

where, 'm' is the personal tax rate.

In case of equity, the after tax rate of return to saver depends on whether the financing comes from retained earnings or new issues. If there is no dividend taxation, net of tax rate of return to saver 'r_n^e' simply becomes $\rho-\pi$, where 'ρ' denotes capital gain in case of retained earning and dividend in case of new issues. Thus, in case of no dividend and no capital gain taxation, the weighted average 'r_n' becomes,

$$r_n = \beta i\,(1 - m) + (1 - \beta)\,\rho - \pi \qquad (8)$$

As regards to the derivation of 'r_n' while there is dividend tax, two new variables 'a' and 'θ' are to be added which denote ratio of new issues to equity and dividend tax rate respectively. Here, weighted average net of tax rate of return to saver 'r_n' will be as follows:

$$r_n = \beta i\,(1 - m) + (1 - \beta)[a\,\rho(1-\theta)+(1\text{-}a)\,\rho] - \pi \qquad (9)$$

It should be noted that in this formula, the growth factor is ignored.

e. Asset-wise and Aggregate Effective Tax Rate

When there is 'r_g'and 'r_n', one can get effective tax rate on investment easily. Here, it should be noted that two types of effective tax rates be calculated - one expressed in terms of total return and other in terms of before tax rate of return. Among these two,

effective tax rate 't' in terms of total return = $r_g - r_n$ (10a)

Accordingly, effective tax rate 't' in terms of gross of tax required rate or before tax rate of return

$$= \frac{r_g - r_n}{r_g} \times 100 \qquad (10b)$$

The aforementioned methodology of calculating effective tax rate is related to the particular asset-wise rate. However, the effective tax rate in aggregate form is more useful than the tax rate in disaggregate form. That is why, aggregate effective tax rates are calculated in this study.

There are two methodologies for calculating aggregate effective tax rates - first, calculating asset-wise effective tax rate at first and then aggregating it on the basis of the weight of the asset or financing and second, finding out aggregate data at first and then calculating effective tax rates as per individual projects and then aggregating later on. In this study, the former technique is used i.e., the asset-wise effective tax rates are calculated at first and aggregated on the basis of the capital stock weight later. The capital stock weight for this analysis is derived as per the weight of the flow of the stock of various assets during 1972/73 to 1996/97 given by the Census of Manufacturing Establishments of 1973/74 and 1996/97.

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