A RAPID METHOD OF ESTIMATING THE DISTRIBUTABLE PROFIT OF CERTAIN SOUTH AFRICAN GOLD MINES RECEIVING STATE ASSISTANCE

By J. J. leR. Cilliers, D.Sc. (Visitor)

ABSTRACT

The recently introduced concept of negative taxation complicates estimation of the distributable profit of certain South African gold mines, and an assisted mine could operate at a working loss and yet produce an overall profit for distribution amongst its shareholders. A simple diagram is presented from which the approximate working profit or loss, taxation payable or tax credit received, and the distributable profit of an assisted mine can be estimated directly for any combination of the four main variable operational factors: tonnage milled, recovery grade, unit cost and capital expenditure.

INTRODUCTION

The effects on the working profits of South African Gold mines caused by changes in unit working costs, recovery grade, tonnage milled and capital expenditure are readily estimated. For normal tax- and lease-paying mines the distributable profit is related to the working profit and the latter is a commonly accepted comparative measure of the profitability of an operation. However, the recently introduced concept of State assistance in the form of negative taxation[1], i.e. a tax credit, for mines with a life of less than eight years complicates such estimates. A requirement of State assistance is that an assisted mine must lower its normal pay limit by 16 to 20 per cent, and it will be possible for a mine to operate at a working loss and yet produce an overall profit for distribution amongst its shareholders. In the case of an assisted mine it is therefore necessary for management to judge the effects of changes in unit costs, grade, etc., in terms of distributable profit instead of working profit. This will require repeated calculation of tax to be paid or tax credits that will be received under the numerous possible combinations of the four main variable factors. However, with the aid of the diagram illustrated in Fig. 1, it is possible to assess at a glance the practical effect of these variables on the distributable profit of an operation not subject to tax on the normal formula, or small mine formula, with sufficient accuracy to decide whether a detailed analysis is required.

USE OF THE DIAGRAM

From the central point '*X*' in Fig. 1, a range of tonnages milled per annum has been plotted along the north-bearing axis, a series of costs per ton milled in the northwestern quadrant, recovery grades in the northeastern quadrant, and capital expenditures in the southwestern quadrant. Starting from the tonnage milled per annum, a line is drawn east and west across the two northern quadrants up to the points where it reaches the desired cost- and grade-lines. From these points two north-south lines are drawn into the southern quadrants. A further line is drawn to the east from the point where the western north-south line crosses the desired capital expenditure. Distributable profit is read off in the southeastern quadrant where this line intersects the eastern north-south line. Every possible combination of

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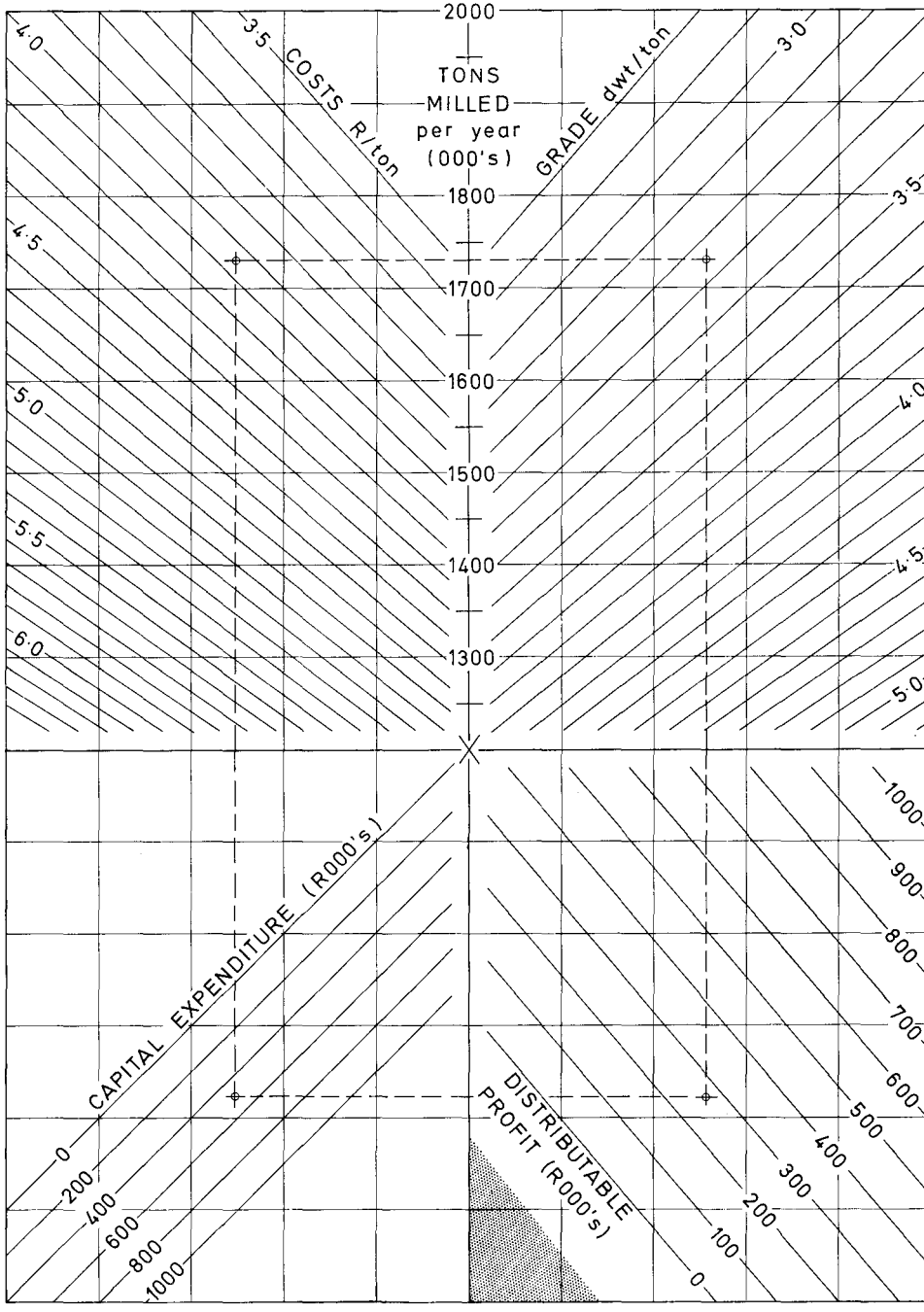

Fig. 1

tonnage milled, recovery grade, unit working cost, capital expenditure and the resultant distributable profit, having allowed for payment of taxation or receipt of a tax credit according to the formula $Y = 68 - \frac{601}{X}$, is therefore represented by a simple rectangle on the diagram.

The rectangle drawn on Fig. 1 illustrates an example of a mine milling 1,730,000 tons per annum of ore with a recovery grade of 3·25 dwt per ton, at a cost of R4.05 per ton milled and which anticipates capital expenditure of R500,000 over the year. It is seen that this mine can expect to earn a distributable profit of R268,000. Any change in conditions can be analyzed by drawing in the appropriate rectangle.

The diagram illustrated in Fig. 1, has been calibrated to analyze mines with a low grade and cost structure, e.g. some of the older mines on the Witwatersrand. It could equally well be used for high-cost mines by *not* changing the tonnage milled along the north-bearing axis, but increasing the values of all four sets of lines by a constant factor. If the values in Fig. 1 are doubled, then, considering as an example the rectangle formed by the outside boundary of the diagram, it can be seen that a mine milling 2,000,000 tons per annum of ore with a recovery grade of 6·40 dwt per ton at a cost of R8.00 per ton and with capital expenditure of R800,000, will earn a distributable profit of just over R700,000 for the year.

A useful advantage of the diagram is that it is possible to determine easily any required combination of the four variables that will result in a pre-selected profit. There is, of course, an infinite number of alternative combinations that would result in the same distributable profit.

CONSTRUCTION OF THE DIAGRAM

The principles from which the diagram is constructed are quite simple, and as the probable range of each of the variables is limited for a specific mine it is convenient to construct a diagram for each mine. As can be seen from Fig. 1, all the functions are linear and it is therefore only necessary to calculate and plot two suitable points for each selected variable and then to draw a straight line through them.

1. Consider first the northwestern quadrant, of which the north-bearing axis represents mill tons (M). The west-bearing axis represents total working costs (W) and the positions of the cost per ton (c) lines are easily determined from the formula:

$$W = Mc \quad \ldots\ldots (1)$$

2. In the northwestern quadrant, the east-bearing axis represents gross mining revenue (R) and with gold at R25.00 per ounce the positions of the recovery grade (g) lines are determined from the formula:

$$R = 1{\cdot}25\, Mg \quad \ldots\ldots (2)$$

3. The total capital expenditure (E) incurred by an assisted mine in any one year is (with some exceptions that are dealt with later) redeemed in full in the year in which it is incurred, so that this amount can be added to the total working costs to obtain the overall costs of the mining operation (C), which is represented by the south-bearing axis of the southwestern quadrant. The positions of the capital expenditure lines are determined from the simple relationship

$$C = W + E \quad \ldots\ldots (3)$$

4. The two axes of the southeastern quadrant therefore represent gross revenue (R) and overall costs (C) of the mining operation.

The taxation payable by an assisted mine is calculated according to the standard formula

$$Y = 60 - \frac{360}{X} \quad \ldots\ldots(4)$$

or according to the so-called 'small mines' formula, or according to the new formula

$$Y = 68 - \frac{601}{X} \quad \ldots\ldots(5)$$

whichever of the three is the most favourable for the mine.

The tax credit received by an assisted mine is calculated according to formula (5) with the proviso that the maximum tax credit will not exceed 25 per cent of the gross mining revenue.

(i) For a mine operating at a profit (P) and liable for tax according to the new formula (5) this formula can be converted to the form

Tax = 68 per cent of taxable profit less 6·01 per cent of gross revenue, or

$$T = 0{\cdot}68\,P - 0{\cdot}0601\,R \quad \ldots\ldots(6)$$

But $P = R - C$ $\ldots\ldots(7)$

Therefore, $T = 0{\cdot}68\,(R - C) - 0{\cdot}0601R$

or $T = 0{\cdot}6199\,R - 0{\cdot}68\,C$ $\ldots\ldots(8)$

For a mine which is not paying lease, the distributable profit is the overall working profit less tax, or

$$D = P - T \quad \ldots\ldots(9)$$

Substituting (7) and (8) in (9) results in

$$D = 0{\cdot}3801\,R - 0{\cdot}32\,C \quad \ldots\ldots(10)$$

From (6) it will be seen that no tax will be payable when $0{\cdot}68\,P = 0{\cdot}0601\,R$

or $P = 0{\cdot}08838 \quad R$

or $P = 8{\cdot}838$ per cent of R

or $X = 8{\cdot}838$ per cent.

Alternatively, it can be seen from (8) that no tax will be payable when $0{\cdot}68\,C = 0{\cdot}6199\,R$

or $R = 1{\cdot}097\,C$ $\ldots\ldots(11)$

(ii) A mine which is not paying lease, and which makes a profit such that its gross revenue is less than 109·7 per cent of its overall working costs will therefore be liable for negative taxation, i.e. it will be entitled to a tax credit. Under these circumstances, formula (5) can be converted into the form

$$\text{Tax credit} = -T = 0{\cdot}0601\,R - 0{\cdot}68\,P \quad \ldots\ldots(12)$$

The distributable profit will now consist of the overall working profit plus the tax credit, or

$$D = P + (-T) \quad \ldots\ldots(13)$$

Substituting (7) and (12) in (13) gives

$$D = 0{\cdot}3801\,R - 0{\cdot}32\,C \quad \text{.....same as (10)}$$

(iii) A mine which is not paying lease and which incurs an overall working loss (L) will be entitled

to a tax credit, and formula (5) can be converted with the form

$$-T = 0{\cdot}0601\,R + 0{\cdot}68\,L \quad \text{.....(14)}$$

The distributable profit will now consist of the tax credit less the overall working loss, or

$$D = (-T) - L \quad \text{.....(15)}$$

$$\text{But, } L = C - R \quad \text{.....(16)}$$

Substituting (14) and (16) in (15) results in

$$D = 0{\cdot}3801\,R - 0{\cdot}32\,C \quad \text{.....same as (10)}$$

It is therefore clear that for an assisted mine which is not paying lease, formula (10) holds whether the mine operates at a profit or at a loss, and regardless of whether a tax credit is received or whether tax is payable according to formula (5). Consequently, the relationship

$$D = 0{\cdot}3801\,R - 0{\cdot}32C \quad \text{.....(10)}$$

is valid under all circumstances where the new formula (5) is applicable and can be used to plot the distributable profit in terms of gross working revenue and overall working costs in the south-eastern quadrant of the diagram subject to that portion of the quadrant where the tax credit would exceed the stipulated maximum.

5. The so-called 'small mines' formula applies to mines with taxable incomes of less than R140,000 per annum. The upper limit where this formula can be applied is therefore $P = 140{,}000$

$$\text{or} \quad R - C = 140{,}000 \quad \text{.....(17)}$$

However, it can be seen from (11) that a tax credit will be payable when R is less than $1{\cdot}097\,C$. As no mine entitled to a tax credit will elect to pay tax on the 'small-mines' formula, the lower limit where this formula can be applied in practice is therefore defined by formula (11).

The field within which it will be advisable for a mine to investigate the possibility of paying tax according to the 'small-mines' formula rather than according to formula (5) can be determined graphically by plotting the two cut-off lines defined by formulae (11) and (17). Alternatively, by substitution of (11) in (17) it will be seen that this field is defined by a narrow triangle with corners at the following co-ordinates

R	C
0	0
140,000	0
1,584,000	1,444,000

6. To determine under what conditions it will be more advantageous for a mine to pay tax according to the standard formula (4) rather than the new formula (5), formula (4) can be converted into the form Tax = 60 per cent of profit after 6 per cent of revenue has been deducted therefrom, or

$$T = 0{\cdot}6\,(P - 0{\cdot}06R) \quad \text{.....(18)}$$

It may be noted that the 5 per cent tax surcharge does not apply to assisted mines, even when taxation is calculated according to the standard formula (4).

By substitution of (7) in (18) it is found that under the standard formula (4)

$$T = 0{\cdot}564\,R - 0{\cdot}6\,C \quad \ldots\ldots(19)$$

From (19) to (7) it is clear that taxation according to the two formulae will be equal when $0{\cdot}564\,R - 0{\cdot}6\,C = 0{\cdot}6199\,R - 0{\cdot}68\,C$

or $$R = 1{\cdot}4311\,C \quad \ldots\ldots(20)$$

From formula (20) a cut-off line can be plotted below which taxation is calculated according to the new formula (5), and above which taxation is calculated according to the standard formula (4). By substitution of (7) and (19) in (9) it is found that above the cut-off line as defined by (20), the distributable profit should be plotted according to the relationship

$$D = 0{\cdot}436\,R - 0{\cdot}4\,C \quad \ldots\ldots(21)$$

7. In the diagram illustrated in Fig. 1, the ranges of the east- and west-bearing axes are R6m to R8m, and that of the south-bearing axis is R6m to R8.4m. The diagram has been reduced four times in size, but if plotted on inch graph-paper with one inch equal to R200,000, intermediate values of distributable profit can, for all practical intents and purposes, be read off by placing an ordinary ruler graduated in inches and tenths at right angles to the distributable profit lines.

Both the 'small-mines' triangle and the field wherein taxation would be payable according to the standard formula (4) fall outside of the ranges chosen for the diagram illustrated in Fig. 1, but they can readily be incorporated where applicable from the co-ordinates given above and from formulae (20) and (21).

The maximum tax credit is equal to 25 per cent of gross working revenue, i.e. when

$$-T = 0{\cdot}25\,R \quad \ldots\ldots(22)$$

From (14), (16) and (22) it can be shown that

$$R = 0{\cdot}7819\,C \quad \ldots\ldots(23)$$

The same result is obtained from (7), (12) and (22).

From formula (23), the cut-off line can be plotted in the southeastern quadrant and that portion of the diagram that cannot be used without modification defined. In Fig. 1, that portion of the diagram where the tax credit is greater than 25 per cent of the gross mining revenue is shaded.

CAPITAL EXPENDITURE REDEMPTION

Current capital expenditure after deducting recoupments of capital expenditure can be redeemed in full in the year in which it is incurred, but should the tax credit reach the stipulated maximum, a portion of the current capital expenditure may be carried forward for redemption in the next year. The amount carried forward will be such that the balance remaining will be just sufficient for the mine to receive the maximum tax credit of 25 per cent of its gross working revenue. From the diagram it will be obvious immediately when this situation arises.

SCALE OF LOSSES

It will be seen that any mine with operations lying within the ranges plotted in Fig. 1 will receive the maximum tax credit only when its loss, after receipt of the tax

credit, is in excess of R175,000 per annum. It will therefore not be possible for a mine to continue operations for any length of time even though it does receive the maximum tax credit.

ADDITIONAL USES OF THE DIAGRAM

As the axes of the southeastern quadrant represent gross working revenue (R) and overall working costs (C), all variables that are functions of R and C can be plotted in this quadrant.

A set of lines representing the working profit (P) or loss (L), i.e. the profit or loss before taxation or tax credit can be plotted from

$$P = R - C \quad \ldots\ldots (7)$$

and $$L = C - R \quad \ldots\ldots (16)$$

Alternatively, the taxation payable or the tax credit that will be received under various conditions can be determined directly by plotting a set of lines from the formulae

$$T = 0{\cdot}6199\,R - 0{\cdot}68\,C \quad \ldots\ldots (8)$$

and $$-\,T = 0{\cdot}68\,C - 0{\cdot}6199\,R \quad \ldots\ldots (24)$$

Transparent overlays of the southeastern quadrant indicating the profit/loss and tax positions can be useful to determine intermediate steps in the calculation of the distributable profit. Thus, for the example illustrated by the dashed lines in Fig. 1, it could be seen that the mine would incur an overall working loss of R480,000, but with a tax credit of R750,000 it would be able to distribute R270,000. Had there been no capital expenditure during the year, the working profit would have been R20,000, which, with a tax credit of R410,000, would have given a distributable profit of R430,000.

LIMITATIONS AND MODIFICATIONS OF THE DIAGRAM

Non-mining income or loss as well as excess recoupments of capital expenditure, e.g. revenue from break-up, have not been taken into account in the construction of the diagram as these items do not enter into tax credit calculations and should be considered separately and in addition to the distributable profit earned from mining operations.

As a mine which has an unredeemed balance of capital expenditure on being classified an assisted mine will be allowed to redeem past capital expenditure, the diagram is not valid until this has been done. In general, this limitation will affect the distributable profit only for the year in which the mine is classified. Redemption and recoupments of capital expenditure as well as the treatment of assessed losses are discussed in detail by Mr E. Wroth[2].

In the case of lease-paying mines, lease payments are deducted from working profits to determine taxable profits, and formula (10) must therefore be modified accordingly. As lease formulae vary from mine to mine, it is not possible to construct a diagram that is universally applicable, but under the normal lease formulae the relationship between distributable profit against gross revenue and overall costs of lease-paying mines remains linear. In the same manner that a cut-off line is determined for maximum tax credit, a line can be plotted for nil lease payment, and formula (10) and the modified formula can be applied on the appropriate sides of the cut-off line. Taking as an example a mine paying lease according to the formula

$$Y = 15 - \frac{90}{X} \quad \ldots\ldots (25)$$

and taking into consideration an additional payment of 1¼ per cent of lease in lieu of transfer duty, it can be seen that no lease will be payable when

$$R = 1{\cdot}0638\,C \qquad (26)$$

and that the distributable profit on the upper side of this cut-off line is determined by the relationship

$$D = 0{\cdot}3344\,R - 0{\cdot}2714\,C \qquad (27)$$

When considering the position of a specific mine, it is necessary to take account of any special provisions in the lease agreement, for example stipulated minimum payments.

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