# Chapter 7

## Equations Connecting the Break-Even Point (BEP) with Net Sales and Returns/Profits: Commonly to both Macro and Micro

### *Foreword to Chapter 7*

What is a unique fundamental to be selected for the GDP-based databases, under six aspect-neutrals and supporting the market principles? This is explained by: How to connect *macro aggregated* as a true basis in a whole system with micro *households and enterprises* initiated by the literature. In another words, what connects macro with micro so as to have economics and its whole system commonly used to all the databases in the actual world?

This chapter presents the author's answer to solve the above questions. Composed of the following two are: (1) Commonly to macro and micro as a final core and (2) the break-even point (BEP), where we have to take into consideration external expenses and total net sales, neglecting traditional recognition of the BEP in the micro corporate accounting. Yes, this chapter is indispensable for our whole system practice. Then, other fundamentals required for our whole system practice are simultaneously connected, consistently and simply. It is suggested: A system for National Accounts (SNA) must pay attention to the equations formed in this chapter for anticipating further improvements in the SNA.

Roughly, macro net sales are the sum of national disposable net income (*Y=NDI*) and external expenses by country. Micro net sales are the sum of value-added (*VA*) and external expenses or non-value added (Non-*VA*) by enterprise in a country. This chapter connects macro net sales with micro net sales, endogenously based on macro *NDI* and commonly to macro and micro. The break-even point (BEP) by enterprise is integrated with the SNA (1993, 2010; SNA). Systematically and commonly, a new BEP equation is composed of three endogenous specified parameters: life-time number of employees÷number of total employees; the level of BEP; and external non-value added÷net sales. The BEP equation is formulated so as to avoid textbook's identity of BEP=1.0000 in corporate accounting, where profits=0, and leads to an integrated structure of the BEP and returns or profits.

Key determinants of the level of BEP to net sales are wages and external expenses. Wages are now brighter. Countries and enterprises each control the level of BEP, both with profit-maximizing pertinent policies and macro basic policies for stop-inequality. Actual statistics databases respectively prevail consistently, commonly, and universally, among macro and micro economies and, promoting political and economic plan-do-see.

**Equations Connecting the Break-Even Point (BEP) with Net Sales and Returns/Profits: Commonly to both Macro and Micro**

## 1. Introduction

Introduction briefly explains the essentials of national disposable net income (*Y=NDI*) before formulating the level of the break-even point (the level of BEP). *NDI* is the target of an integrated structure of 'the BEP and returns or profits' obtained by adding external expenses or non-value added (Non-VA). The level of the break-even point (the level of BEP) unites macro and micro accounts in statistics with endogenous data, under the market principles prevailing like next to God. The level of BEP makes both macro and micro economies robust by year and over years. The clue is 'wages' existing commonly to *NDI* and value added (*VA*).

There exist several essentials in macro and micro. *GDP* presents these essentials but remains ad hoc and, causes and effects are vertically amount-oriented. When wages are measured endogenously, all of the parameters and variables are simultaneously measured. Causes are equal to results, in not one but two ways and resulting in theory=practice. Let us present key roles in endogenous data.

By the author's proof of 'consumption-neutral to growth and technology,' technology is independent of population. This is basically because the rate of technological progress is endogenously measured by $g^*_{A(FLOW)} = i(1-\beta^*)$, where $i = I/Y$ is the ratio of net investment to national disposable net income and, $\beta^*$ is the technology coefficient, $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$. The $\beta^*$ includes the rate of change in population, $n_E = n = (L_t - L_{t-1})/L_{t-1}$. The KEWT database shown by amounts and ratios always hold under full-employment and closely to the origin of the two-dimension plane. Is labor as one component of labor productivity, $y = Y/L$, differently from labor used in $\beta^*$? Answer is No. However, two weights hidden in labor productivity is solely influenced by labor used in denominator, while $\beta^*$ is influenced by $i = I/Y$ much more than labor due to an empirical proof that the real rate of return is maximized when $i = I/Y$ is minimized.

This chapter focuses on the level of BEP. Behind this chapter, the above measurements are all accurately united. For simplicity, the author does not refer to related chapters when the level of BEP is numerically processed step by step. Wages are most fundamental 'determinant' among other determinants in *ND*I and *VA*. Also wages connect macro with macro, purely endogenously under no assumption. Or, relationship between macro and micro cannot be solved without wages and the wage rate, $w = W/L$, where returns and profits are simultaneously measured. Wages are closest to human, individual, and people and more broadly, to 'organic system' made by individual and system.

## 2. Amount equations connecting the BEP with net sales and Returns/profits, macro and micro

This chapter connects national disposable net income, *Y=NDI*, with total net sales, $X$. Non-value added (Non-VA) is composed of external expenses and defined as $Z$ so that $X = Y + Z$ holds. In the macro level, $Y = C + S = W + \Pi$ is endogenously measured, where $W$ is wages and, $\Pi$ is returns. In the micro level, $X = E + \Pi$, where $E$ is total expenses and $\Pi$ is profits, by enterprise. $E$ is composed of Non-VA and wages: $E = Z + W$. How are total expenses divided into fixed and variable expenses? This division is related to employment system by country. For example, if life-time employment system spreads as had been respected in Japan, wages were fully fixed expenses. If part-time employment system spreads as seen in the current situation of many countries, the author needs to set up the life-time-share parameter in the employment system, $L_{TIME}$ equals life-time employment numbers divided by total employment numbers: e.g., $L_{TIME} = 0.9$, $L_{TIME} = 0.5$, or $L_{TIME} = 0.1$. Most importantly, the BEP is connected with the employment system and the life-time-share parameter.

To formulate the BEP equation precisely, the author needs four supporting parameters besides the above life-time-share parameter. The goal of the BEP equation is to maximize profits and realize the profit maximum principle. This goal is attained when the BEP equation sets the ratio of profits to net sales, $\pi = \Pi/X$, an independent variable. The above four supporting parameters are: 1) The level of BEP sales to total net sales, $bep_X = BEP_X/X$, which must be less than 1.0; e.g., $bep_X = 0.9$, $bep_X = 0.7$, or $bep_X = 0.5$. 2) The level of non-value added to total net sales, $z = Z/X$, which must be less than 1.0; e.g., $z = 0.8$, $z = 0.45$, or $z = 0.1$. 3) Wages divided by net sales, $w_X = W/X$. 4) The average-incremental equation that is composed of two weight parameters connecting average with incremental, $W_{T1} = L_0/L_1$ *and* $W_{T2} = (L_1 - L_0)/L_1$, where denominator values of $y = Y/L$ only determine two weights existing between average and incremental.

$$bep_X = \frac{BEP_X}{X} = \frac{1-(z+(1-L_{TIME}\cdot w_X))}{L_{TIME}\cdot w_X} = \frac{1-v}{f} \tag{1}$$

Eq. 1 presents a key for solving endogenous relationship found between the macro and micro levels. Nevertheless Eq. 1 expresses a base for solving problems, not wholly but partially. For wholly, Eq. 1 depends on Axiom of 'a constant capital-output ratio'; as empirically measured and proved in the *EES*. This axiom is theoretically proved by converting R., Sato's (1981) exogenous Conservation Laws to endogenous Laws (see, Notes at the beginning of the *EES*). Concretely, the initial capital-output ratio, $\Omega_0$, immediately turns to purely endogenous, as soon as $\Omega_0$ is tentatively set as an arbitrary value, where $\Omega = \Omega^* = \Omega_0$ holds. What does this mean by a constant capital-output ratio and wholly as a system?

Let us recall an identity that the relative share of capital equals the product of the capital-output ratio and the rate of return: $\alpha = \Omega \cdot r$. Suppose, $\Omega = \Omega^* = \Omega_0 = 2.0000$. According to 'the deficit-neutral' among six neutrals in the *EES*, the real rate of returns/profits (i.e., returns or profits) is zero or *RRR*=0, so that the rate of inflation/deflation corresponds with the growth rate of output, as focused in a separate chapter. Actually and endogenously, the relative share of capital is determined by the nominal rate of inflation/deflation, $r_{INF/DEF}$. For example, if $r_{INF/DEF} = 0.05$, $\alpha = 0.1000 = 2.0000 \cdot 0.05$ holds and, if $r_{INF/DEF} = 0.10$, $\alpha = 0.2000 = 2.0000 \cdot 0.10$ holds. It implies that growth and technology are independent of $\alpha = \Omega \cdot r$. Wages and returns are each replaced by $W = (1-\alpha)Y$ and $\Pi = \alpha \cdot Y$, where $z = Z/X$ and $Y = (1-z)X$. As a result, $w_X = W/X = (1-\alpha)(1-z)$ and $\pi = \alpha(1-z)$ hold by reducing net sales, $X$. Note, the author does not use $\alpha_X = \Pi/X$ but $\alpha = \Pi/Y$, here solely. Taking into consideration the life-time-share parameter, $\alpha$ is replaced by $L_{TIME}$ (recall, $L_{TIME} = 0.9$, $L_{TIME} = 0.5$, or $L_{TIME} = 0.1$).

Therefore, Eq. 1 is reformulated by the following Eq. 2.

From $bep_X = \frac{BEP_X}{X} = \frac{1-(z+(1-L_{TIME} \cdot w_X))}{L_{TIME} \cdot w_X} = \frac{1-v}{f}$,

$$bep_X = 1 - \frac{z/(1-z)}{L_{TIME}(1-\alpha)}. \quad (2)$$

Suppose: $L_{TIME} = 0.7 = \alpha / r_{INF/DEF}$, $\alpha = 0.2000 = 2.0000 \cdot 0.10$, and $z = 0.1$ or $\frac{z}{1-z} = \frac{0.1}{0.9} = 0.1111$. $bep_X = 1 - \frac{0.1111}{0.7 \times 0.8} = 1 - 0.19834 \fallingdotseq 0.8$. These three parameters are determined by national taste, preferences, culture, and history, by countries.

Let us verify and confirm factual results of the BEP equation. Two tables are presented, Tables 1 and 2. The author designed to combine these results with those in the average-incremental equation. The author focused the average-incremental equation in a separate chapter, where the BEP equation and the average-incremental equation are conclusively integrated.

**Table 1** expresses typical results of Eq. 1, combining three specified parameters, life-time employment divided by total employment numbers, $L_{TIME}$; the level of the BEP sales to total net sales, $bep_X = BEP_X/X$; and the level of Non-VA to total net sales, $z = Z/X$ or $z/(1-z)$. Given the relative share of capital, $L_{TIME}$ primarily determines $bep_X = BEP_X/X$, with the change in $z/(1-z)$ and, following the difference of $\alpha = 0.5, 0.4, 0.3, 0.2,$ and $0.1$. The LHS of Table 1 sets $L_{TIME} = 0.9$ and the RHS $L_{TIME} = 0.8$. On both sides, $bep_X = BEP_X/X$ becomes 'out of measure' (see minus bold font), along with the increase of external expenses. 'Out of measure' seems to be caprice yet,

expresses wrong combinations of the three specified parameters. The three combinations are actually delicate and the author cannot easily analogize.

**Table 1** The BEP levels designed by combining three specified parameters (1)

| $L_{TIME}$ | z | z/(1-z) | 1-α | $bep_X$ | $L_{TIME}$ | z | z/(1-z) | 1-α | $bep_X$ |
|---|---|---|---|---|---|---|---|---|---|
| 0.9 | 0 | 0 | 0.5 | 1 | 0.8 | 0 | 0 | 0.5 | 1 |
| 0.9 | 0.1 | 0.111111 | 0.5 | 0.7531 | 0.8 | 0.1 | 0.111111 | 0.5 | 0.7222 |
| | | | 0.4 | 0.6914 | | | | 0.4 | 0.6528 |
| | | | 0.3 | 0.5885 | | | | 0.3 | 0.5370 |
| | | | 0.2 | 0.3827 | | | | 0.2 | 0.3056 |
| | | | 0.1 | **(0.2346)** | | | | 0.1 | **(0.3889)** |
| | 0.2 | 0.25 | 0.5 | 0.4444 | | 0.2 | 0.25 | 0.5 | 0.3750 |
| | | | 0.4 | 0.3056 | | | | 0.4 | 0.2188 |
| | | | 0.3 | 0.0741 | | | | 0.3 | **(0.0417)** |
| | | | 0.2 | **(0.3889)** | | | | 0.2 | **(0.5625)** |
| | | | 0.1 | **(1.7778)** | | | | 0.1 | **(2.1250)** |
| | 0.3 | 0.428571 | 0.5 | 0.0476 | | 0.3 | 0.428571 | 0.5 | **(0.0714)** |
| | | | 0.4 | **(0.1905)** | | | | 0.4 | **(0.3393)** |
| | | | 0.3 | **(0.5873)** | | | | 0.3 | **(0.7857)** |
| | | | 0.2 | **(1.3810)** | | | | 0.2 | **(1.6786)** |
| | | | 0.1 | **(3.7619)** | | | | 0.1 | **(4.3571)** |

**Note**: Tables 1 and 2 each show the calculation of Eq. 1 and Eq. 2. The target is $bep_X = BEP_X/X$, whose range must be plus.

**Table 2** below, to make $bep_X = BEP_X/X$ available range or plus values, is divided into two experiments, the top and the bottom, each expanding the range of $L_{TIME}$, from 0.9 to 0.4. The RHS of the top still shows minus values of $bep_X = BEP_X/X$. What is the reason? The reason is solely traced back to low levels of the relative share of labor or wages. National disposable net income (*Y=NDI*) or value added (*VA*) is the sum of wages and returns or profits so that wages must be higher when consumption increases. The author understands this logic now here.

Both sides of the bottom all show plus values of $bep_X = BEP_X/X$. What is the reason? The reason is traced back to higher levels of the relative share of labor or wages, 0.95, 0.9, 0.85, 0.8, 0.75, and 0.7. Nevertheless, the LHS of Table 2 shows, lower $bep_X = BEP_X/X$ while the RHS of Table 2 shows higher $bep_X = BEP_X/X$. What is the reason? The reason is solely traced back to the level of $z/(1-z)$. This fact is justified at once: 'External expenses' determine $bep_X = BEP_X/X$. No one can deny this fact.

In short, the three specified parameters' combinations determine the level of $bep_X = BEP_X/X$. Key parameters are 'wages' and 'external expenses' and accordingly, $z/(1-z)$. This conclusion matches our common sense in the actual world by country and by enterprise, yet the author is able to precisely measure the role lying in the three specified parameters, based on the *EES*.

**Table 2** The BEP levels designed by combining three specified parameters (2)

| $L_{TIME}$ | z | z/(1-z) | 1-α | $bep_X$ | $L_{TIME}$ | z | z/(1-z) | 1-α | $bep_X$ |
|---|---|---|---|---|---|---|---|---|---|
| 0.9 | 0 | 0 | 0.5 | 1.0000 | 0.9 | 0 | 0 | 0.2 | 1.0000 |
| 0.8 | 0.05 | 0.052632 | | 0.8750 | 0.8 | 0.05 | 0.052632 | | 0.6875 |
| 0.7 | 0.1 | 0.111111 | | 0.7143 | 0.7 | 0.1 | 0.111111 | | 0.2857 |
| 0.6 | 0.15 | 0.176471 | | 0.5000 | 0.6 | 0.15 | 0.176471 | | **(0.2500)** |
| 0.5 | 0.2 | 0.25 | | 0.2000 | 0.5 | 0.2 | 0.25 | | **(1.0000)** |
| 0.4 | 0.25 | 0.333333 | | **(0.2500)** | 0.4 | 0.25 | 0.333333 | | **(2.1250)** |
| 0.9 | 0 | 0 | 0.4 | 1.0000 | 0.9 | 0 | 0 | 0.1 | 1.0000 |
| 0.8 | 0.05 | 0.052632 | | 0.8438 | 0.8 | 0.05 | 0.052632 | | 0.3750 |
| 0.7 | 0.1 | 0.111111 | | 0.6429 | 0.7 | 0.1 | 0.111111 | | **(0.4286)** |
| 0.6 | 0.15 | 0.176471 | | 0.3750 | 0.6 | 0.15 | 0.176471 | | **(1.5000)** |
| 0.5 | 0.2 | 0.25 | | 0.0000 | 0.5 | 0.2 | 0.25 | | **(3.0000)** |
| 0.4 | 0.25 | 0.333333 | | **(0.5625)** | 0.4 | 0.25 | 0.333333 | | **(5.2500)** |
| 0.9 | 0 | 0 | 0.3 | 1.0000 | 0.9 | 0 | 0 | 0.05 | 1.0000 |
| 0.8 | 0.05 | 0.052632 | | 0.7917 | 0.8 | 0.05 | 0.052632 | | **(0.2500)** |
| 0.7 | 0.1 | 0.111111 | | 0.5238 | 0.7 | 0.1 | 0.111111 | | **(1.8571)** |
| 0.6 | 0.15 | 0.176471 | | 0.1667 | 0.6 | 0.15 | 0.176471 | | **(4.0000)** |
| 0.5 | 0.2 | 0.25 | | **(0.3333)** | 0.5 | 0.2 | 0.25 | | **(7.0000)** |
| 0.4 | 0.25 | 0.333333 | | **(1.0833)** | 0.4 | 0.25 | 0.333333 | | **(11.5000)** |

| $L_{TIME}$ | z | z/(1-z) | 1-α | $bep_X$ | $L_{TIME}$ | z | z/(1-z) | 1-α | $bep_X$ |
|---|---|---|---|---|---|---|---|---|---|
| 0.9 | 0.5 | 1 | 0.95 | 0.4152 | 0.9 | 0.2 | 0.25 | 0.95 | 0.7661 |
| 0.8 | | | 0.9 | 0.3827 | 0.8 | | | 0.9 | 0.7531 |
| 0.7 | | | 0.85 | 0.3464 | 0.7 | | | 0.85 | 0.7386 |
| 0.6 | | | 0.8 | 0.3056 | 0.6 | | | 0.8 | 0.7222 |
| 0.5 | | | 0.75 | 0.2593 | 0.5 | | | 0.75 | 0.7037 |
| 0.4 | | | 0.7 | 0.2063 | 0.4 | | | 0.7 | 0.6825 |
| 0.9 | 0.4 | 0.666667 | 0.95 | 0.5322 | 0.9 | 0.1 | 0.111111 | 0.95 | 0.8830 |
| 0.8 | | | 0.9 | 0.5062 | 0.8 | | | 0.9 | 0.8765 |
| 0.7 | | | 0.85 | 0.4771 | 0.7 | | | 0.85 | 0.8693 |
| 0.6 | | | 0.8 | 0.4444 | 0.6 | | | 0.8 | 0.8611 |
| 0.5 | | | 0.75 | 0.4074 | 0.5 | | | 0.75 | 0.8519 |
| 0.4 | | | 0.7 | 0.3651 | 0.4 | | | 0.7 | 0.8413 |
| 0.9 | 0.3 | 0.428571 | 0.95 | 0.6491 | 0.9 | 0.05 | 0.052632 | 0.95 | 0.9415 |
| 0.8 | | | 0.9 | 0.6296 | 0.8 | | | 0.9 | 0.9383 |
| 0.7 | | | 0.85 | 0.6078 | 0.7 | | | 0.85 | 0.9346 |
| 0.6 | | | 0.8 | 0.5833 | 0.6 | | | 0.8 | 0.9306 |
| 0.5 | | | 0.75 | 0.5556 | 0.5 | | | 0.75 | 0.9259 |
| 0.4 | | | 0.7 | 0.5238 | 0.4 | | | 0.7 | 0.9206 |

**Note:** Tables 1 and 2 each shows the calculation of Eq. 1 and Eq. 2. The target is $bep_X = BEP_X/X$, whose range must be plus.

## 3. Ratio equations connecting the BEP with net sales and Returns/profits, macro and micro

This chapter clarifies an integrated structure of the BEP and returns/profits in net sales including external expenses, *Z*: *X*=*Y*+*Z*. Required roles are the following:

1) Not to mix the BEP equation with the returns/profits equation.
2) Absolute values should be first measured. Next, related ratios should be calculated for consistent confirmation.
3) Commonly to the macro level using returns by country and to the micro level using enterprise's profits.
4) Returns/profits (i.e., returns for macro and profits for micro) is dependent variable yet, measured simultaneously, with $L_{TIME}$: $X = h(\Pi, L_{TIME}) \rightarrow X = h(\Pi)$.
5) The returns/profits equation essentially starts with macro and spreads micro. Macro and micro are independent and yet consistently integrated in the *EES*.

Start net sales, $X = F + V + \Pi$ and $Y = W + \Pi$. (3)

$$X = Y + Z = (W + \Pi) + Z.$$

Wages (amount) *W* is divided into variable and fixed expenses, where the notation of $W_X = W$ is used, solely to distinguish *W* generally applicable to the macro level with $W_X$ needed for this chapter.

$W_X = (1 - L_{TIME})W_X$ for variable + $L_{TIME} \cdot W_X$ for fixed.

Then, total variable expenses: $V = (1 - L_{TIME})W_X + Z$. Total fixed expenses:

$F = L_{TIME} \cdot W_X$ Thus, $X = (1 - L_{TIME})W_X + Z + L_{TIME} \cdot W + \Pi$.

Therefore, $\Pi = X - V - F = X - \big((1 - L_{TIME})W_X + Z\big) - L_{TIME}W_X$ (4)

Eq. 5 is reduced, by dividing Eq.4 by *X* and using $w_X = W_X/X$, as follows:

$$\pi = 1 - v - f = 1 - \big((1 - L_{TIME})w_X + z\big) - L_{TIME} \cdot w_X \quad (5)$$

Eqs. 4 and 5 each hold with an adjuster of the life-time-share parameter, $L_{TIME}$. Without taking into consideration of $L_{TIME}$, both equations cannot be solved. The break-even point (BEP) is expressed by $BEP_X = \frac{X-V}{F}$ or, $bep = (1 - v)/f$, where a necessary condition is $(X - V) = F$ or, $(1 - v) = f$. The necessary condition is numerically verified using two extreme cases soon below.

Two extreme employment systems are simply derived as follows:

1) If $L_{TIME} = 1.0$, under a life-time employment system, $\Pi = X - Z - W_X$ holds, where variable expenses, $V = Z$.
2) If $L_{TIME} = 0.0$, under complete part-time employment system, $\Pi = X -$

$(Z + W_X)$ holds, where fixed expenses, $F = 0$.

Let us show an example, where *X*=100, *Y*=80, $W_X = W = 50$, $\Pi = 30$, and Z=20. Returns equation is expressed by,

$30 = 100 - (50(1 - L_{TIME}) + 20) - 50L_{TIME}$.

If $L_{TIME} = 1.0$, $30 = 100 - 20 - 50$, under $V = Z = 20$.

If $L_{TIME} = 0.0$, $30 = 100 - (20 + 50)$, under $F = 0$.

Each break-even point (BEP) is calculated as follows:

Can we solve the above two extreme cases when the life-time-share parameter, $L_{TIME}$ is specified? It is, of course, impossible for us to solve this problem attributed to $BEP_X = \frac{X-V}{F}$ and $bep = (1 - v)/f$.

We may need goal seek for adjusting or obtaining the life-time-share parameter, $L_{TIME}$. However, the returns/profits equation empirically finds a fact that the same value of $L_{TIME}$ is never found in the equation, by using *goal seek* of the Excel. This is because $\frac{1-L_{TIME}}{L_{TIME}} = \frac{1}{L_{TIME}} - 1$ hyperbolically appears in $X = h(\Pi, L_{TIME}) \rightarrow X = h(\Pi)$ (see Appendix Hyperbolic attributions, soon after sixteen Chapters in the *EES*).

Finally, let us verify the returns/profits equation, which is independent of the BEP equation. **Table 3** is amounts-based. **Table 4** is ratios-based. Top of Table 3 shows the BEP results. Middle and bottom of Table 3 each show the results of the returns/profits equation, using the same factors and parameters. Thus, Table 3 clarifies the relation between the returns/profits equation and the BEP equation.

**Table 4** uses reduced ratios and the author confirms that Tables 3 and 4 are consistent. Table 4, further, tests the goal seek results in the Excel. The author expected, before starting, that the author might get alternatives by changing the life-time-share parameter, $L_{TIME}$. The author found that the idea was wrong.

Conclusively, the returns/profits equation presents new fact-findings.

1) Relation between fixed and variable expenses is severely clarified in the returns/profits equation. The BEP equation cannot wholly express the structure of net sales.
2) The returns/profits equation is naturally connected with wages and its role. Macro starts with national disposable net income but needs the returns equation.
3) Macro develops from national disposable net income to the returns equation, while micro develops from net sales to the profits equation. The returns/profits equations unit macro with micro and, policies are well

connected with strategies.

**Table 3** BEP and net sales integrated structure: using amounts

| | $L_{TIME}$ | $BEP_X$ | X-V-Π | F | **Y** | $\mathbf{W_X}$=**W** | Π | Z |
|---|---|---|---|---|---|---|---|---|
| | 0.9 | 1.0000 | 45 | 45 | 80 | 50 | 30 | 20 |
| | 0.8 | 1.0000 | 36 | 36 | 75 | 45 | 30 | 25 |
| | 0.7 | 1.0000 | 28 | 28 | 70 | 40 | 30 | 30 |
| | 0.6 | 1.0000 | 21 | 21 | 65 | 35 | 30 | 35 |
| | 0.5 | 1.0000 | 15 | 15 | 60 | 30 | 30 | 40 |
| | 0.4 | 1.0000 | 10 | 10 | 55 | 25 | 30 | 45 |
| | 0.3 | 1.0000 | 6 | 6 | 50 | 20 | 30 | 50 |
| | 0.2 | 1.0000 | 3 | 3 | 45 | 15 | 30 | 55 |
| | 0.1 | 1.0000 | 1 | 1 | 40 | 10 | 30 | 60 |
| | $L_{TIME}$ | Π | **X** | F | **Y** | $\mathbf{W_X}$=**W** | V | Z |
| | 0.9 | 30 | 100 | 45 | 80 | 50 | 25 | 20 |
| | 0.8 | 30 | 100 | 36 | 75 | 45 | 34 | 25 |
| | 0.7 | 30 | 100 | 28 | 70 | 40 | 42 | 30 |
| | 0.6 | 30 | 100 | 21 | 65 | 35 | 49 | 35 |
| | 0.5 | 30 | 100 | 15 | 60 | 30 | 55 | 40 |
| | 0.4 | 30 | 100 | 10 | 55 | 25 | 60 | 45 |
| | 0.3 | 30 | 100 | 6 | 50 | 20 | 64 | 50 |
| | 0.2 | 30 | 100 | 3 | 45 | 15 | 67 | 55 |
| | 0.1 | 30 | 100 | 1 | 40 | 10 | 69 | 60 |
| | $L_{TIME}$ | Π | **X** | F | **Y** | $\mathbf{W_X}$=**W** | V | Z |
| | 0.9 | 30.0 | 100 | 45 | 80 | 50 | 25 | 20 |
| | 0.8 | 26.0 | 100 | 40 | 75 | 45 | 34 | 25 |
| | 0.7 | 23.0 | 100 | 35 | 70 | 40 | 42 | 30 |
| | 0.6 | 21.0 | 100 | 30 | 65 | 35 | 49 | 35 |
| | 0.5 | 20.0 | 100 | 25 | 60 | 30 | 55 | 40 |
| | 0.4 | 20.0 | 100 | 20 | 55 | 25 | 60 | 45 |
| | 0.3 | 21.0 | 100 | 15 | 50 | 20 | 64 | 50 |
| | 0.2 | 23.0 | 100 | 10 | 45 | 15 | 67 | 55 |
| | 0.1 | 26.0 | 100 | 5 | 40 | 10 | 69 | 60 |
| Y/X | $L_{TIME}$ | Π | **X** | F | **Y** | $\mathbf{W_X}$=**W** | V | Z |
| 0.5 | 0.5 | 25.0 | 100 | 12.5 | 50 | 25 | 63 | 50 |
| | 0.4 | 25.0 | 100 | 10 | 50 | 25 | 65 | 50 |
| | 0.3 | 25.0 | 100 | 7.5 | 50 | 25 | 68 | 50 |
| | 0.2 | 25.0 | 100 | 5 | 50 | 25 | 70 | 50 |
| Y/X | 0.1 | 25.0 | 100 | 2.5 | 50 | 25 | 73 | 50 |
| 0.25 | 0.5 | 12.5 | 100 | 6.25 | 25 | 12.5 | 81 | 75 |
| | 0.4 | 12.5 | 100 | 5 | 25 | 12.5 | 83 | 75 |
| | 0.3 | 12.5 | 100 | 3.75 | 25 | 12.5 | 84 | 75 |
| | 0.2 | 12.5 | 100 | 2.5 | 25 | 12.5 | 85 | 75 |
| | 0.1 | 12.5 | 100 | 1.25 | 25 | 12.5 | 86 | 75 |

**Note:** Tables 3 and 4 each show the calculation of Eq. 3, Eq. 2, and 5. Bold $X, Y,$ and $W$ are keys for raising the wage rate, consistently with Tables 1 and 2.

| | $L_{TIME}$ | $BEP_X$ | 1-v-π | f | $\mathbf{y_X}$ | $\mathbf{w_X}$ | π | z |
|---|---|---|---|---|---|---|---|---|
| | 0.9 | 1.0000 | 0.45 | 0.45 | 0.80 | 0.50 | 0.30 | 0.20 |
| | 0.8 | 1.0000 | 0.40 | 0.40 | 0.80 | 0.50 | 0.30 | 0.20 |
| | 0.7 | 1.0000 | 0.35 | 0.35 | 0.80 | 0.50 | 0.30 | 0.20 |
| | 0.6 | 1.0000 | 0.30 | 0.30 | 0.80 | 0.50 | 0.30 | 0.20 |
| | 0.5 | 1.0000 | 0.25 | 0.25 | 0.80 | 0.50 | 0.30 | 0.20 |
| | 0.4 | 1.0000 | 0.20 | 0.20 | 0.80 | 0.50 | 0.30 | 0.20 |
| | 0.3 | 1.0000 | 0.15 | 0.15 | 0.80 | 0.50 | 0.30 | 0.20 |
| | 0.2 | 1.0000 | 0.10 | 0.10 | 0.80 | 0.50 | 0.30 | 0.20 |
| | 0.1 | 1.0000 | 0.05 | 0.05 | 0.80 | 0.50 | 0.30 | 0.20 |
| | $L_{TIME}$ | Π | **X** | F | **Y** | $\mathbf{W_X}$=**W** | V | Z |
| | 0.9 | 0.195 | 1.00 | 0.55 | 0.80 | 0.55 | 0.26 | 0.20 |
| | 0.8 | 0.140 | 1.00 | 0.55 | 0.80 | 0.55 | 0.31 | 0.20 |
| | 0.7 | 0.085 | 1.00 | 0.55 | 0.80 | 0.55 | 0.37 | 0.20 |
| | 0.6 | 0.030 | 1.00 | 0.55 | 0.80 | 0.55 | 0.42 | 0.20 |
| | 0.5 | (0.025) | 1.00 | 0.55 | 0.80 | 0.55 | 0.48 | 0.20 |
| | 0.4 | (0.080) | 1.00 | 0.55 | 0.80 | 0.55 | 0.53 | 0.20 |
| | 0.3 | (0.135) | 1.00 | 0.55 | 0.80 | 0.55 | 0.59 | 0.20 |
| | 0.2 | (0.190) | 1.00 | 0.55 | 0.80 | 0.55 | 0.64 | 0.20 |
| | 0.1 | (0.245) | 1.00 | 0.55 | 0.80 | 0.55 | 0.70 | 0.20 |
| | $L_{TIME}$ | Π | **X** | F | **Y** | $\mathbf{W_X}$=**W** | V | Z |
| | 0.9 | 0.380 | 1.00 | 0.45 | 0.88 | 0.50 | 0.17 | 0.12 |
| | 0.8 | 0.260 | 1.00 | 0.40 | 0.75 | 0.45 | 0.34 | 0.25 |
| | 0.7 | 0.230 | 1.00 | 0.35 | 0.70 | 0.40 | 0.42 | 0.30 |
| | 0.6 | 0.210 | 1.00 | 0.30 | 0.65 | 0.35 | 0.49 | 0.35 |
| | 0.5 | 0.200 | 1.00 | 0.25 | 0.60 | 0.30 | 0.55 | 0.40 |
| | 0.4 | 0.200 | 1.00 | 0.20 | 0.55 | 0.25 | 0.60 | 0.45 |
| | 0.3 | 0.210 | 1.00 | 0.15 | 0.50 | 0.20 | 0.64 | 0.50 |
| | 0.2 | 0.230 | 1.00 | 0.10 | 0.45 | 0.15 | 0.67 | 0.55 |
| | 0.1 | 0.260 | 1.00 | 0.05 | 0.40 | 0.10 | 0.69 | 0.60 |
| Y/X | $L_{TIME}$ | Π | **X** | F | **Y** | $\mathbf{W_X}$=**W** | V | Z |
| 0.5 | 0.5 | 0.250 | 1.00 | 0.13 | 0.50 | 0.25 | 0.63 | 0.50 |
| | 0.4 | 0.250 | 1.00 | 0.10 | 0.50 | 0.25 | 0.65 | 0.50 |
| goal seek | 0.2970 | 0.250 | 1.00 | 0.07 | 0.50 | 0.25 | 0.68 | 0.50 |
| TEST | 0.2 | 0.250 | 1.00 | 0.05 | 0.50 | 0.25 | 0.70 | 0.50 |
| Y/X | 0.1 | 0.250 | 1.00 | 0.03 | 0.50 | 0.25 | 0.73 | 0.50 |
| 0.25 | 0.5 | 0.125 | 1.00 | 0.06 | 0.25 | 0.13 | 0.81 | 0.75 |
| goal seek | 0.4000 | 0.125 | 1.00 | 0.05 | 0.25 | 0.13 | 0.82 | 0.75 |
| TEST | 0.3 | 0.125 | 1.00 | 0.04 | 0.25 | 0.13 | 0.84 | 0.75 |
| | 0.2 | 0.125 | 1.00 | 0.03 | 0.25 | 0.13 | 0.85 | 0.75 |
| | 0.1 | 0.125 | 1.00 | 0.01 | 0.25 | 0.13 | 0.86 | 0.75 |

**Table 4** BEP and net sales integrated structure: using reduced ratios

**Note:** Tables 3 and 4 each show the calculation of Eq. 3, Eq. 2, and 5. Bold $X, Y,$ and $W$ are keys for raising the wage rate, consistently with Table 1 and Table 2.

## 4. Conclusions

Let us wholly and geometrically sum up conclusions using questions and answers, Q & A.

**Q1**: Why is the break-even point (BEP) formulated as an identity of the BEP=1.0000 in corporate accounting?

**A1**: The ratio BEP holds when fixed assets to net sales, $f = F/X$, equals $1 - V/X$, where profits are zero and $f = 1 - v$ holds. It is impossible for us to formulate the level of BEP, in the micro level.

**Q2**: Why is the SNA not connected with the BEP equation hitherto?

**A2**: The SNA as statistics cannot measure the sum of wages and returns, since *NDI* differs from *GDP*. *GDP* may estimate the sum of saving and consumption but, this actual amount differs from the sum of wages and returns. Also, for the BEP level requires a necessary condition of the sum of saving and consumption = the sum of wages and returns. This condition cannot be measured in the SNA.

**Q3**: Why do statistics data have time lag between causes and effects/results?

**A3**: This is natural as long as we use statistics data. This is not the responsibility of statistics and systems. Purely endogenous data simultaneously have causes = results and are free from assumptions to justify equation formulation.

**Q4**: Why is the wage rate a key for the level of BEP?

**A4**: Wages is able to raise the level of the wage rate and directly, no others. Even net investment cannot directly raise the wage rate under the profit maximization principle.

**Q5**: Why is the level of BEP consistent with the market principles that have vertical limit by goods, services, and market?

**A5**: This is because the BEP level measures the amount of wages first of all, not directly the wage ratio. The amount is the product of price and quantity so that it is free from price by goods and by services shown in the textbooks.

**Q6**: Why is the level of BEP consistent with endogenous wages that reduce returns or profits?

**A6**: This is because returns and profits increase under minimized net investment.

**Q7**: What is philosophy behind the level of BEP?

**A7**: The origin of Philosophy is moderation and corresponds with the origin of two-dimensions in the plain. Moderation is not measured but amounts and

ratios approach close to moderation. Moderation leads us to mind happiness with sustainable robustness of economies. And, this is controlled by combining three specified parameters designed in an integrated structure of the BEP and returns or profits.

In short, the BEP, returns, and profits are newly connected with wages and, net sales and Non-Value Added are absorbed into a whole system. Problems hidden in the wage rate are mechanically clarified and tested. Drucker's advice to Japan or, 'life-time employee system' to match Japanese culture and civilization are now empirically proved in this chapter, using the KEWT database.

## References

### 1. Related to Peter F. Drucker

Drucker's references, but this chapter here shows broadly and formally.
(Citing, chapter of Life-Time individual and systems)

The united-measure system (the U-M system), from the viewpoint of economics and econometrics, connects the macro level by country with the micro level by household and enterprise. The U-M system, from the viewpoint of management, connects managers with employees. Management is individual-oriented while economics is macro-oriented; strategies in management and policies in macroeconomics are interrelated and matching. The author is most eager to read 'precious words' discussed by Peter F. Drucker (1909-2005) as genius in one century. Luckily, Ueda, Atsuo, Tokyo, as one of his students, has recorded those precious words throughout Drucker's lifetime. Fortunately, the *EES* and its geometrical discoveries have empirically proved Drucker's lifetime management fact-findings; applying endogenous equations and reduced-hyperbola graphs to the essentials of Drucker's 'learning by doing.' The author most respects a handbook written by Ueda, Atsuo (2009, the 100$^{th}$ birthday anniversary; Tokyo: Diamond Co., 256p.). In particular, the author lists the following three books written by Drucker. These books are commonly applicable to i) U-M system, ii) life-time productivity, and iii) from the BEP to net sales:

Drucker, Peter, F. (1939). *The end of Economic Man: The Origin of Totalitarianism*. New York: John Day Co. 271p.

Drucker, Peter, F. (1999). *Management Challenges for the 21$^{st}$ Century*. New York: Harper Collins Publishers Inc. 207p.

Drucker, Peter, F. (2002). *Managing in the Next Society*. New York: St. Martin's Press. 321p.

## 2. List of the first appearances of 'hyperbola' BEP equations in the literature:

Kamiryo, Hideyuki (1965, in Japanese). *Productivity Analysis*. Tokyo: Japan Management Association (Awarded by Year Prize; Dr. Eiichi Furukawa). 350p.

Kamiryo, Hideyuki (1974). *A Comparison of Financial Objectives and Behavior in Japanese and American Firms*. Master of Science in Management, Sloan School of Management, MIT. 426p. (nominated for the Brooks Prize Award).

Kamiryo, Hideyuki (1984). *The Integrated Method to Measuring Profitability and Productivity with Special References to the Comparison of Agriculture and Manufacturing Within and Between Countries*. PhD in agricultural economics, Lincoln College, Univ. of Canterbury, nz. 461p. (after Master of Applied Science).

Kamiryo, Hideyuki (1994). International Hon. PhD. in Environmental Science, May 1994, International Earth Environment University, the US, granted by Linus C. Pauling and Hisatoku Komaki with special courtesy.

Kamiryo, Hideyuki (1995). *The Structural Theory of Flows, Assets, Debt, and Equity in Accounting for Business Enterprises*. PhD in commercial science, Hiroshima Shudo University. 558p. (with additional supplement, 393p.).

Kamiryo, Hideyuki (2003). *Furthering the Role of Corporate Finance in Economic Growth.* PhD in economics, the University of Auckland, nz. 129p.

Kamiryo, Hideyuki (2013). *Earth Endogenous System: to Answer the current unsolved Economic Problems.* Better Advances Press, Toronto, lxviii+568p. (see Amazon).

## 3. Original list of the first appearances of the BEP And its extended equations

The following three books have been my research bible of the EBEP up-to-date, with my research-father of Dr. Kaichiro Nishino in eternity.

Kneoppel, C. E. (1933). *Profit Engineering: Applied Economics in Making Business Profitable*. New York: McGraw-Hill. xvi+ 326p.

Kneoppel, C. E. and E. G. Seybold (1937). *Managing for Profit: Working Method for Profit Planning*. New York and London: McGraw-Hill. xvi+ 343p.

Vatter, W. J. (1947; 1969). *The Fund Theory of Accounting and Its Implications for Financial Reports.* Chicago: The University of Chicago Press. 141p.