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# Preserved Value Approach for Asset Valuation

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***Abstract*— Paper describes the new approach to the valuation of partially exhausted economic asset. Approach is based on the economic equivalency of the cash flows generated by appraised asset and the same asset when it was new. Described approach involves the concept of time value of money and considers the exhausted asset as mutually exclusive alternative to the same asset when it was new. Unlike the well-known asset valuation approaches, the proposed pre-served value approach assumes the first cost of asset, cash flows in past and fu-ture, and includes the planned lifetime of asset. Paper introduce the methodology and guidelines for calculations in two options – for "Steady expectations method" and "Discontinuity method". Proposed approach may be applied to the asset valuation if the asset first cost and planned life time are not defined, but the similar or alike asset may be selected.**

***Keywords*— *Asset Valuation, Mutually Exclusive Alternatives, Preserved Value Approach.***

## 1. Introduction

Asset valuation is one of the most important problem in business management. The asset valuation mostly justifies the price of the contract between the owner who sells the asset, and the buyer who acquires the asset. In this case the owner is intended to value the asset as high as possible, and the buyers desire is quite opposite. In certain cases, like business separation, or valuation of property to be transferred, or asset insuring, there are the side persons interested in minimization or maximization value. These persons do not participate in transaction directly but able to influence the arrangement. For example, when the donated property is valuated, the state authorities are interested in maximization of value due to higher tax obligations. Sometimes the side persons may impact significantly.

## 2. Systematization of Asset Valuation Approaches

Valuation approaches may be systematized in four basic categories [1]:

- cost approach based on calculation of costs of the owner;
- asset based approach considering company book or financial data;
- market approach based on the statistics of market transactions;
- income approach based on assumptions of the future profit to be generated by asset.

Each approach has two options as shown at fig. 1 basing on several standards and handbooks like [2-9], all of them are very similar in methodology. The approach options may be differed by the basic source of financial information needed for valuation. For example, in cost approach the basic information may be received from the calculation of expenses for creation of the asset that is able to replace the valued asset. That is like the cost of replacement method works. Or, data may be obtained from the calculation of expenses needed for creation of the valued asset itself. Thus we get the cost of creation method.

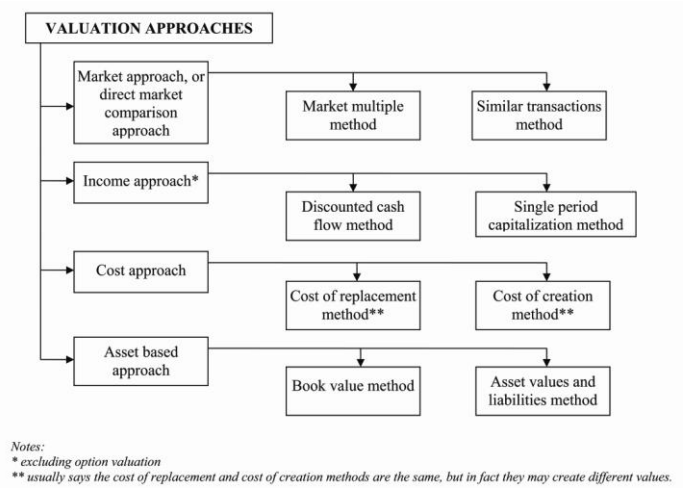


Fig. 1. Systematization of common approaches to the asset valuation.

Looking from the time domain, we can see that four well known approaches consider either financial information from past or assumption about future cash flows. as shown at fig. 2. Income approach "looks to the future" and is based on the assumption about possible future income generated by the asset. Income approach supposes that expected life time of the asset may be changed under the influence of owner intentions. Asset based approach and cost approach are "looking back" in time and assuming information about cash flows existed in past. Market approach considers short period of past looking for purchase agreement with the similar or alike asset. Possibly, the most popular methods for asset valuation are the Discounted Cash Flow method (DCF), and Single Period

Capitalization, or Capitalization of Earnings method (CE). Both DCF and CE methods are well described and show their closeness in the methodological basis.

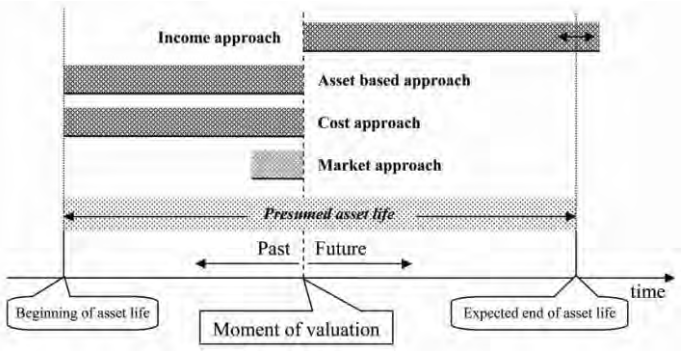


Fig. 2. Time domain view to the common approaches to the asset valuation.

Associated to the CE calculations are much simpler than to DCF. As result, there is a rather unreasonable opinion between professionals in business valuation (at least in Russia) that CE contributes less error in the final asset value. Anyway, the both methods DCF and CE do not consider initial cost of the asset that may impact the valuation essentially.

## 3. Preserved Value Concept for Asset Valuation

Proposing in this paper preserved value approach for the asset valuation acts within the concept of time value of money. The core idea of the method is the claim that partially exhausted asset and the same asset when it was new are the mutually exclusive alternatives. That means the partially exhausted asset and the same asset when it was new must show the equal economic benefit to owner during the life time. Both assets may generate mismatching cash flows due to change of intensions. Basics of the method were introduced in [10].

The methodology of selection of mutually exclusive alternatives is well described in [11] and some other sources, and refers to the Equivalent Annual Worth, EAW. Due to some specific issues of real assets the Equivalent Periodic Worth, or EPW, not tied to the year duration, will be used in this paper. Specifics was introduced in [12].

Thus we may place the preserved value approach into the system of valuation approaches. From time domain, the proposed approach shows it's specialty (see fig. 3 in comparison to fig.2) because it combines information about the asset from its past and the assumptions concerning the asset future.

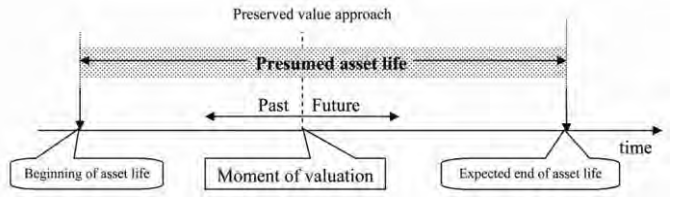


Fig. 3. Time domain view to the Preserved value approach.

Therefore proposed approach covers the cash flows of total expected lifetime from the beginning of asset life to the expected end of asset life. The described specific features of preserved value approach form the attributes that obviously distinguish it from the common valuation methods, and allow to define the preserved value approach as the new approach to the asset valuation.

Preserved value approach may be realized in the next few steps.

Step 1. – Calculation of the Equivalent Periodic Worth (EPW) of asset. Calculation is basing on the available data of the owner about the initial cost of the asset, the asset cash flow before the moment of valuation, and the prospective cash flow presumably generated during the future part of asset life time. In general, the EPW is calculated as follows:

$$EPW = \frac{i*(1+i)^n}{(1+i)^n - 1} * \sum_{t=0}^{n} \frac{C_t}{(1+i_t)^t} \quad (1)$$

where Ct – real or prospective value of cash flow at the time period number t, n – total amount of periods of time of asset lifetime. The first element in equation (1), C0 , is the asset first, or initial cost. The last element in equation (1), Cn , is the sum of the cash flow at the end of life and the liquidation worth. Parameter it in equation (1) is the interest rate at the time period number t. In general case the it values may vary. If it values are different, the i value may be calculated as following:

$$i = \sqrt[n]{\prod_{t=1}^{n}(1+i_t)} - 1 \quad (2)$$

Otherwise, if the it are uniform at all t then i= it .

Step 2. – Calculation of the present worth of the future cash flow of asset. This cash flow will be generated by the asset after the moment of purchase according to the buyer plan of asset utilization:

$$PV_{buyer} = \sum_{t=m+1}^{n} \frac{C_t^f}{(1+i_t)^{t-m}} \quad (3)$$

where Cft – prospective value of cash flow at the time period number t, it – interest rate at the time period number t, n – total amount of periods of time of asset lifetime, m – number of period of asset lifetime when the asset is valuated. Must be noted that C f m+1 in equation (3) is the buyer estimation of cash flow that will be generated by the asset immediately after the moment of purchase, and Cfn is the sum of the final cash flow and the liquidation worth according to buyer plan.

Step 3. – Calculation of the present worth of EPW during the future life of the partially exhausted asset. To be performed as follows:

$$PV_{EPW} = EPW \Big/ \frac{i*(1+i)^{n-m}}{(1+i)^{n-m} - 1} \quad (4)$$

where i, n, and m are the same as in equations (1)-(3).

Step 4. – Calculation of asset value. Finally, the asset value may be calculated:

$$AV = PV_{buyer} - PV_{EPW} \quad (5)$$

Diagram of asset value AV calculation is presented at the figures 4 and 5.

## 4. NOTES TO THE APPROACH

1. Preserved value approach cumulates the advantages of income approach based on the concept of time value of money; hence the interest rate must be justified carefully.

2. Asset lifetime is completely different from the depreciation concept. Asset lifetime may be calculated as the economic life, or may be chosen basing on the life of similar or alike asset, or may involve the benchmarking.

3. Buyer may have own opinion concerning the asset lifetime; if the asset lifetime is changed under buyers intention, the EPW must be calculated basing on the updated duration of asset lifetime.

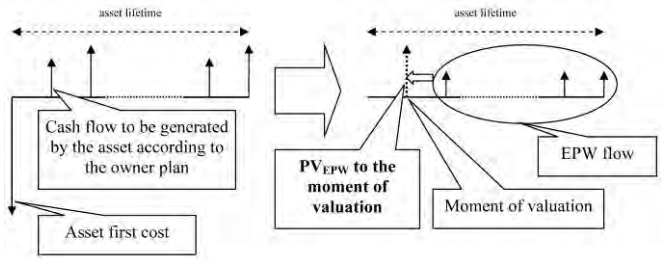


Fig. 4. Diagram for calculation of $PV_{EPW}$ in preserved value approach.

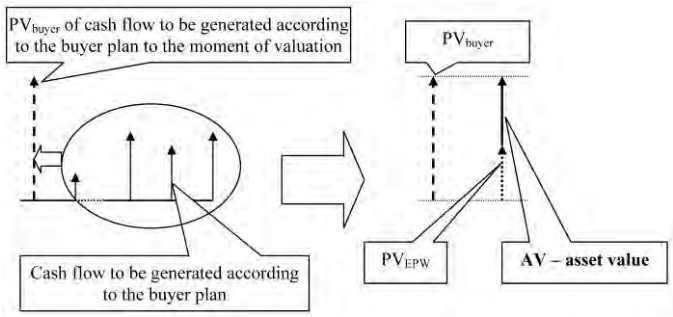


Fig. 5. Diagram for calculation of the value of asset in preserved value approach.

There is a specific case. If buyer of valued asset supposes to utilize it as before, i.e. no changes to cash flow and lifetime, and interest rate is fixed during asset lifetime, the calculation of AV may be simplified significantly:

$$AV = C_0 * \frac{(1+i)^n - (1+i)^m}{(1+i)^n - 1} \quad (6)$$

where C0 – asset first cost, i – interest rate n – total amount of periods of time of total asset lifetime, m – number of period of time in asset lifetime when the asset is valuated.

Thus appears the simplified version of Preserved Value Approach, or "Steady Expectations Method". The full version of Preserved Value Approach, the "Discontinuity Method", allows changes in utilization of asset after purchase, changes in future cash flow, and changes in asset presumed lifetime.

The most general situation is described in Discontinuity Method. Typical example accompanied by spreadsheet in Open Office Calc is provided below.

Example. Asset under valuation features by:

- first cost is USD 10 million,
- as owner planned initially, assumed lifespan is 10 years,
- as owner planned initially, asset annual worth is USD 3 million during five years, and from the sixth year it will be decreasing by 5% every year,
- liquidation worth is USD 1 million,
- asset is valuating after 3 years of operation,
- buyer assumes that the asset will be worthwhile during next 5 years; after that asset will be liquidated at USD 1 million worth.

Decision of example is given at figures 6 and 7. Fig. 6 shows the result of valuation in cell named AV equal to USD 7,340,309.03. Fig. 7 represents the formulas in the spreadsheet. Method given in spreadsheet at figures 6 and 7 is equivalent to the four steps described above and depicted at figures 4 and 5.

B18 =E13-B17

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Year | Cash Flow as Owner Plans | Discounted Cash Flow as Owner Plans | Cash Flow as Buyer Plans | Discounted Cash Flow as Buyer Plans |
| 2 | 0 | -10 000 000,00 $ | -10 000 000,00 $ | | |
| 3 | 1 | 3 000 000,00 $ | 2 500 000,00 $ | | |
| 4 | 2 | 3 000 000,00 $ | 2 083 333,33 $ | | |
| 5 | 3 | 3 000 000,00 $ | 1 736 111,11 $ | *moment of valuation | |
| 6 | 4 | 3 000 000,00 $ | 1 446 759,26 $ | 3 000 000,00 $ | 2 500 000,00 $ |
| 7 | 5 | 3 000 000,00 $ | 1 205 632,72 $ | 3 000 000,00 $ | 2 083 333,33 $ |
| 8 | 6 | 2 850 000,00 $ | 954 459,23 $ | 2 850 000,00 $ | 1 649 305,56 $ |
| 9 | 7 | 2 707 500,00 $ | 755 613,56 $ | 2 707 500,00 $ | 1 305 700,23 $ |
| 10 | 8 | 2 572 125,00 $ | 598 194,07 $ | 3 572 125,00 $ | 1 435 556,92 $ |
| 11 | 9 | 2 443 518,75 $ | 473 570,30 $ | | |
| 12 | 10 | 3 321 342,81 $ | 536 415,41 $ | | |
| 13 | | NPV | 2 290 088,99 $ | PV | 8 973 896,04 $ |
| 14 | Interest rate | 20,00% | | | |
| 15 | | | | | |
| 16 | EPW | 546 238,34 $ | | | |
| 17 | NPVepw | 1 633 587,01 $ | | | |
| 18 | AV | 7 340 309,03 $ | | | |

Fig. 6. Calculation example for Discontinuity Method in Open Office Calc.

B18 =E13-B17

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Year | Cash Flow as Owner Plans | Discounted Cash Flow as Owner Plans | Cash Flow as Buyer Plans | Discounted Cash Flow as Buyer Plans |
| 2 | 0 | -10 000 000,00 $ | =B2/(1+$B$14)^A2 | | |
| 3 | 1 | 3 000 000,00 $ | =B3/(1+$B$14)^A3 | | |
| 4 | 2 | =B3 | =B4/(1+$B$14)^A4 | | |
| 5 | 3 | =B4 | =B5/(1+$B$14)^A5 | *moment of valuation | |
| 6 | 4 | =B5 | =B6/(1+$B$14)^A6 | =B6 | =D6/(1+$B$14)^(A6-3) |
| 7 | 5 | =B6 | =B7/(1+$B$14)^A7 | =B7 | =D7/(1+$B$14)^(A7-3) |
| 8 | 6 | =B7*0,95 | =B8/(1+$B$14)^A8 | =B8 | =D8/(1+$B$14)^(A8-3) |
| 9 | 7 | =B8*0,95 | =B9/(1+$B$14)^A9 | =B9 | =D9/(1+$B$14)^(A9-3) |
| 10 | 8 | =B9*0,95 | =B10/(1+$B$14)^A10 | =B10+1000000 | =D10/(1+$B$14)^(A10-3) |
| 11 | 9 | =B10*0,95 | =B11/(1+$B$14)^A11 | | |
| 12 | 10 | =B11*0,95+1000000 | =B12/(1+$B$14)^A12 | | |
| 13 | | NPV | =SUM(C2:C12) | PV | =SUM(E6:E10) |
| 14 | Interest rate | 20,00% | | | |
| 15 | | | | | |
| 16 | EPW | =-PMT(B14;10;C13) | | | |
| 17 | NPVepw | =-PV(B14;5;B16) | | | |
| 18 | AV | =E13-B17 | | | |

Fig. 7. Formulas for Discontinuity Method in Open Office Calc.

As follows from equation (6), Steady Expectations Method is represented by simple factor to be applied to the asset first cost. Asset value in this case depends on interest rate, expected lifetime, and year of valuation. Fig. 8 shows the correspondence between asset value and year of estimation at the selected interest rates under the assumption of preserving value. Lifetime of given asset is 10 years. The graph on fig. 8

shows the value of asset as the part of first cost depending on the year of valuation at four interested rates: 1%, 6%, 12%, and 20%. Important, that the graph on fig. 8 shows the behavior not usually found on free market. According to the fig. 8, the early years of asset utilization decrease its cost less than late years. For example, at 20% interest the first year of utilization decreases the value from 100% to approximately 96% while the seventh year drops the value from 61.75% to 50.24%. All this happen under assumption of preserving value.

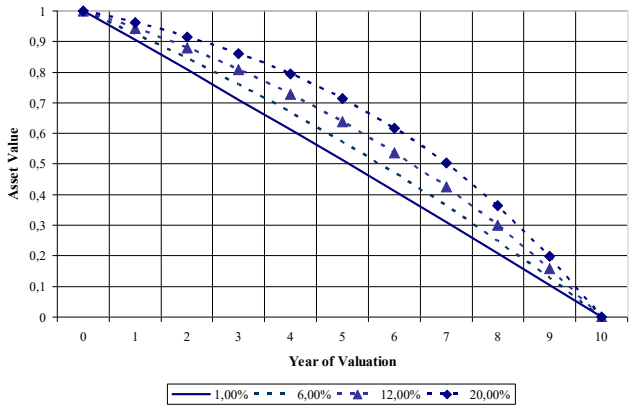


Fig. 8. Correspondence between asset value and year of valuation at different interest rates under the preserving value concept - Steady Expectations Method.

Vise versa, on the free market the greatest decrease of the asset value is observed during the first year of asset life. For the most general equipment the market value, so called "market recommended cost", falls by 20% during the first year and no matter what is risk-free or sectorial interest rate. Acquiring the partially exhausted asset at the "market recommended cost" the buyer earns extra profit being generated by the gap between the "market recommended cost" and the cost based on preserving value concept. This fact explains apparently why there is the latent opinion that acquisition of used equipment in good condition is more profitable than of new one.

## 5. Conclusion

There are disputes about "justice" in valuation. If valuation is closer to the expectations of owner, appraiser may be accused of the overpricing the asset to support the owner position. If valuation is closer to the expectations of buyer, the appraiser may be accused of cooperation in business raiding, especially if the asset under valuation is the part of ineffective business. Anyway, appraising practice causes unsubstantiated accusations in unethical behavior or secret deal too frequently. The only strength of the appraiser is the straight methodology whereby valuation becomes less vulnerable.

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