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### **CALCULATION METHOD OF COMPANY FULL LOAN VALUE TAKING INTO ACCOUNT INCOMING CASH FLOWS**

**Abstract.** Financial intermediaries with the purpose to sale effectively their loan products successfully combine credit a reduced interest rate on the loan and increased commission, compensate expenses at the expense of insurance companies, raised rates for cash management services and other derivatives of loan services. Despite that, the calculation of full loan value has binding effects only in the provision of consumer loans to commercial banks.

The article substantiates the need for financial institutions to inform companies about the estimated total cost of financing. The tax shield is taken into account as input cash flow of the borrower- legal entity in determining the full loan value. Depreciation protection, by analogy, is defined as a part of algorithm calculation which takes into account credit conditions in the process of renewal of fixed assets.

**Keywords:** tax shield, depreciation protection, estimated total loan value, full loan value, «actual» interest rate.

**JEL Classification:** G21, G3

Formulas: 8; fig.: 0; tabl.: 1; bibl.: 16.

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### **МЕТОДИКА РОЗРАХУНКУ ПОВНОЇ ВАРТОСТІ КРЕДИТУ ДЛЯ ПІДПРИЄМСТВА ІЗ ВРАХУВАННЯМ ВХІДНИХ ГРОШОВИХ ПОТОКІВ**

**Анотація.** У статті обґрунтовано необхідність інформування фінансовими установами підприємств про орієнтовну сукупну вартість фінансування. Ураховано податковий щит як вхідний грошовий потік позичальника – юридичної особи при визначенні повної вартості кредиту. Амортизаційний захист, за аналогією, визначено як складову частину алгоритму розрахунку, який ураховує всі умови кредитування при оновленні основних фондів.

**Ключові слова:** податковий щит, амортизаційний захист, орієнтовна сукупна вартість кредиту, повна вартість кредиту, «реальна» процентна ставка.

Формул: 8; рис.: 0; табл.: 1; бібл.: 16.

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### **МЕТОДИКА РАСЧЕТА ПОЛНОЙ СТОИМОСТИ КРЕДИТА ДЛЯ ПРЕДПРИЯТИЙ С УЧЕТОМ ВХОДЯЩИХ ДЕНЕЖНЫХ ПОТОКОВ**

**Аннотация.** В статье обоснована необходимость информирования финансовыми учреждениями предприятий об ориентировочной совокупной стоимости финансирования. Учтен налоговый щит как входной денежный поток заемщика – юридического лица при определении полной стоимости кредита. Амортизационная защита, по аналогии, определена

как составляющая часть алгоритма расчета, который учитывает все условия кредитования при обновлении основных фондов.

**Ключевые слова:** налоговый щит, амортизационная защита, ориентировочная совокупная стоимость кредита, полная стоимость кредита, «реальная» процентная ставка.

Формул: 8; рис.: 0; табл.: 1; библи.: 16.

**Problem statement.** The calculation of full loan value has binding effects only in the provision of consumer loans to commercial banks. It is clear that legal entities which have financial analysts on the staff can independently determine full loan value. On the other hand, under the present conditions in medium-sized regions, there is a significant number of legal entities that operate on the general and simplified taxation system, with a limited number of staff, and objectively unable to assess the actual loan value. Financial intermediaries with the purpose to sale effectively their loan products successfully combine credit a reduced interest rate on the loan and increased commission, compensate expenses at the expense of insurance companies, raised rates for cash management services and other derivatives of loan services. After all, the provision of funding is the best argument for attracting clients for comprehensive services to the bank. For this category of borrowers it is appropriate to show the «actual» loan value as well as in the provision of consumer loan.

**Review of recent publications.** The liabilities for settlements of estimated full loan value in Ukraine is provided for by law [1-5]. However, regulatory documents require financial institutions to do so only in the process of consumer loan services. Domestic scientists generally agree to the fact that the borrower need to understand precisely the cost of financing: O. Butenko, L. Dobryk, T. Losyeva and I. Onufriyчук, K. Molodyko [6–8]. Thoughts of practitioners in the banking sector are divided: V. Mishchenko and O. Shapoval [9] note that the banks systematically avoid fulfilling the requirements of normative acts on informing the consumers about loan conditions and full loan value, and O. Popova [10], on the contrary, sees unfair competition is that such requirements are distributed exclusively on the banks. A number of foreign experts of the financial sector provide examples of calculation methods of the actual cost of credit funds for financial products for natural persons: P. Bond, D. Musto and B. Yilmaz [11], M. Dukic and S. Gongeta [12], J. Vohwinkle [13]. Classics of financial theory R. Brealey and S. Myers[14] improved application methodology of tax and depreciation shield for the companies.

**Unresolved issues.** In their researches, scientists thoroughly study methods, theory and practice of calculating the estimated full loan value. On the other hand, practicing financial experts are not interested in providing information about full loan value more than required by law. Therefore, the method of calculating the cost of financing for the companies is imperfect.

**The goal of this research is** to substantiate the possibilities of using tax and depreciation shield when calculating the estimated total loan value for the companies.

**Key research findings.** Algorithm for calculating the total loan value is given in the resolution of the National Bank of Ukraine «On approval of regulations to provide by the banks of Ukraine information to a consumer about loan conditions and total loan value:

$$NLA = \sum_{t=1}^n \frac{Flow_t}{(1+d)^t}, \quad (1)$$

where  $d$  – “actual” interest rate;

$NLA$  – net loan amount, issued to a consumer;

$t$  – serial number of the loan agreement validity period (month or day);

$n$  – total residual amount of the loan agreement validity periods (months or days) on the settlement date;

$Flow_t$  – the amount of money that the consumer pays to the bank and other persons on the loan.

Formula 1 has a number of disadvantages, namely:

1) the term «actual» should consider the change of purchasing power of money over a certain period;

2) according to the conventional symbols in the denominator of each additive component  $t$  - is the number of the agreement validity period (day or month), then  $d$  is the rate for the corresponding period, that is either daily or monthly, but not annual[15].

The formula is the basis for calculating the function «XIRR» MS «Excel» allows to eliminate these disadvantages:

$$0 = \sum_{i=1}^N \frac{P_i}{(1 + speed)^{\frac{(d_i - d_1)}{365}}} \quad (2)$$

where:  $d_i$  – date of  $i$  (last) payment;

$d_1$  – date of 0 payment (initial date);

$P_i$  – amount of  $i$  (last) payment.

Exactly this algorithm of calculating the «actual» interest rate is offered in the explanations contained in the «Rules» [1].

Formula 2 takes into account only those payments which are made by the borrower in the process of loan services. Arithmetic sum of these discounted expenses makes out coming cash flow. However, incoming cash flow should also be taken into account when calculating the total loan value. When ignoring this requirement the calculation rate cannot be considered to be final. When getting a financial package the borrower may have the following typical incoming cash flows:

- tax protection for the income tax and other taxes;
- protection for depreciation allowances;
- reimbursement of interest rate on the loan due to government programs, grants and others.

In the event that the recipient of resources acts as a legal entity-payer of corporate income tax, the formula for calculating the estimated total value needs to be improved, namely: to reduce cash flow by the amount of tax shield according to this tax. Incoming payment must be considered as negative in the period of its actual occurrence. It, as well as the outgoing payment is a subject to discounting. According to the Tax Code of Ukraine, the amount of monthly advance payments is not less than 1/12 of the accrued amount of corporate income tax for the previous reporting tax year[16]. That is tax shield can be displayed in the cash flow of the reporting period.

On the basis thereof the cash flow can be represented as follows:

$$P_i = (CF_{out_i} - CF_{in_i}), \quad (3)$$

where:  $CF_{out_i}$  – borrower's payments for benefit of creditors and third parties in  $i$ -period;

$CF_{in_i}$  – borrower's tax protection according to income tax in  $i$  period;

$P_i$  – borrower's cash flow in  $i$  period.

Borrower's cash flow on the loan shall be reduced by:

$$CF_{in_i} = \frac{SIR_i \cdot RT_c}{100}, \quad (4)$$

where:  $RT_c$  – income tax rate of legal entities in percentage terms;

$SIR_i$  – sum of percentages to be paid in  $i$  period.

To calculate the estimated total loan value, taking into account the annual format of all output data, including tax protection for corporate income tax, formula 2 will take the following form:

$$0 = \sum_{i=1}^N \frac{CF_{out_i} - \frac{SIR_i \cdot RT_c}{100}}{(1 + r)^{\frac{(d_i - d_1)}{365}}}, \quad (5)$$

where:  $r$  (speed from formula 2) – estimated total loan value for the borrower.

According to the resolution adopted by the NBU «On approval of regulations to provide by the banks of Ukraine information to a consumer about loan conditions and total loan value» detailed description of the total loan value should include:

- the value of interest rate and method of its calculation;
- the list, size and basis to calculate all bank fees related to the loan;
- the list and amount of other financial liabilities arising for benefit of third parties [1].

All these costs of the borrower relate to his/her gross expenditures [16] and thus tax protection for the income tax is also distributed on them.

On the basis thereof, formula 5 can be improved as follows:

$$0 = \sum_{i=1}^N \frac{CF_{out_i} - \frac{(SIR_i + C_{a_i}) \cdot RT_c}{100}}{(1+r)^{\frac{(d_i-d_1)}{365}}}, \quad (6)$$

where:  $C_{a_i}$  – related expenses.

If the borrower is a legal entity that is under general taxation system and it is planned to use the borrowed funds to purchase the fixed assets, then the financial result before taxation will be reduced by the amount of fixed assets depreciation, calculated taking into account the minimum acceptable term of useful use of fixed assets and other non-current assets [16]. The same time the company will get a depreciation tax shield.

Let's make the assumption that financing to purchase the fixed assets coincided with the beginning of the reporting tax period, the company has balance-sheet profit and is under general taxation system. In this case, formula 6 can be written as follows:

$$0 = \sum_{i=1}^N \frac{CF_{out_i} - \frac{(SIR_i + C_{a_i} + A_i) \cdot RT_c}{100}}{(1+r)^{\frac{(d_i-d_1)}{365}}}, \quad (7)$$

where:  $A_i$  – accrued depreciation of the corresponding period.

In order to substantiate the use and visibility can consider the following example of buying real estate with the use of credits for one year:

- cost of real estate (CRE): 150000 \$;
- loan amount (CR): 120000 \$;
- the loan repayment scheme: standard;
- interest rate (IR): 10 % p.a.;
- insurance (INS): 0,1 % (150 \$);
- transaction costs ( $C_{a_i}$ ): 1000 \$;
- system-accrual loan: American (30/360);
- tax rate on business profits (TC): 15 %;
- amortization (A): proportionally during 60 months.

$$CF_0 = \frac{-CR + INS + C_{a_i} - (INS + C_{a_i}) \cdot TC}{(1+r)^0} = -119022,50\$ \quad (8)$$

Further, adding the data for the calculation of  $CF_i$  c  $CF_1$  до  $CF_{12}$  into the table 1:

Table 1

Reference table for the calculation of the formula 7

i	$CF_{out_i}, \$$	$A_i, \$$	$(SIR_i + A_i) \cdot RT_c, \$$	$CF_{out_i} - CF_{in_i}, \$$	$(1+r)^i$
1	11000,00	1250,00	337,50	10604,04	$(1+r)^{30/360}$
2	10916,67	1250,00	325,00	10475,84	$(1+r)^{60/360}$
3	10833,33	1250,00	312,50	10348,72	$(1+r)^{90/360}$
4	10750,00	1250,00	300,00	10222,69	$(1+r)^{120/360}$
5	10666,67	1250,00	287,50	10097,73	$(1+r)^{150/360}$
6	10583,33	1250,00	275,00	9973,83	$(1+r)^{180/360}$
7	10500,00	1250,00	262,50	9850,99	$(1+r)^{210/360}$
8	10416,67	1250,00	250,00	9729,19	$(1+r)^{240/360}$
9	10333,33	1250,00	237,50	9608,43	$(1+r)^{270/360}$
10	10250,00	1250,00	225,00	9488,71	$(1+r)^{300/360}$
11	10166,67	1250,00	212,50	9370,01	$(1+r)^{330/360}$
12	10083,33	1250,00	200,00	9252,32	$(1+r)^{360/360}$
Total	126500,00	15000,00	3225,00	119022,50	-

Source: compiled by the author.

Substituting the appropriate values into the formula 7 and obtain  $r = 6,82\%$ . If calculate the effective interest rate excluding tax and depreciation shield, its value will be 12,52%.

Formula 7 is the final objective of conducted study. However, in some cases, the borrower can expect compensation of interest rates due to state programs, grants or other compensatory

mechanism. In this case, the expected amount of compensation should be taken into account (discounted) as negative in the cash flow of the corresponding period.

**Conclusions and prospects for further research.** On the developed markets, financial institutions are counterbalanced by the cash flow of subjects, which have surplus liquidity and those which need external financing, executing the intermediary function. Substantial changes are in the structure of bank market, which became investigation of global economic crisis, political instability and public tension, entailed the sharp slump of trust to financial a sector. It in the same time negatively influenced on the increase of resources. In the other side, financial institutes must successfully place the attracted money for providing of interest payment depositors and receipt of marginal and commission income. Inflationary expectations, shortage of resources and absence of trust of users of holdings services, are instrumental in the increase of interest rates after the passive products of financial mediators. Accordingly, interest rates rise after active products. The increase of lending rates is accompanied reduction of terms of crediting. «Short» and «expensive» credits can be justified only absence of mortgage. The users of such services are private persons. A services is given as a consumer credit. Percent's payment after such credit is only one of outgoing cash flow of borrower. The product conditions can contain non-permanent and monthly commissions which are counted on the remain of debt or to the amount of the all loan. Services of insurance companies and notary are also paid a recipient. Certainly, financial literacy of potential borrowers needs permanent perfection. However, it cannot have time after industry of professional marketing specialists and financiers which create various credit products and packages of financial services, doing an accent on a «low» interest rate. Sometimes, manipulation allows to advertise numbers by credits with an interest rate which approaches zero. The desired profit is arrived at due to other payments of client, both directly on the account of creditor and in behalf of the third side with subsequent indemnification of the received less payments. With the changes of necessities of users of financial services financial institutions are constantly perfected. Creating new financial products modeled business processes imposed requirements on information security. Certainly, that limited to only combining of difficult and often bulky packages of financial services not possibly. In addition, for providing of maximal capitalization it will be financial services of corporate participants of market to decide unique financial problems which need the use of instruments of the financial engineering.

The conducted study allowed us to create a methodology for calculating the full loan value for the companies that takes into account incoming cash flows. The given calculation algorithm takes into consideration tax and depreciation shield as components of cash flow, which is the result of getting a loan to finance the replacement of fixed assets. Not only borrowers- legal entities but also financial institutions-creditors have “benefit” due to this format of information provision on accompanying the process of financing. Promising in terms of future research is the consideration of incoming cash flows from loan interest compensation when calculating the estimated total cost of financing.

In addition, non-bank financial and credit institutions which are specialized on the consumer crediting also can use a formula 7. First – this credit unions, pawnshops and leasing companies. Using this methods they will promote market environment for banking and non-banking financial institutions in the provision of equal economic content consumer credit information services of the estimated total cost of credit.

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- Стаття надійшла до редакції 28.09.2017* © Добровольський О. І.

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*Received 28.09.2017*

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