

Computer Modeling of Leasing Operations

Aleksandr Mikhaylovich Batkovskiy^{1*}, Elena Georgievna Semenova²,
Valeriy Yaroslavovich Trofimets³, Elena Nikolaevna Trofimets³ and Alena Vladimirovna Fomina¹

¹Joint Stock Company, Central Research Institute of Economy, Management and Information Systems, Electronics, Moscow, Russia; batkovskiy_a@instel.ru, fomina_a@instel.ru

²Institute of Innovation and Basic Postgraduate Training, St. Petersburg State University of Aerospace Instrumentation, St. Petersburg, Russia; egsemenova@mail.ru

³The Department of Higher Mathematics and Systems Modeling of Complex Processes, Saint-Petersburg University of State Fire Service of Emercom of Russia, St. Petersburg, Russia; zemifort@inbox.ru, ezemifort@inbox.ru

Abstract

Objectives: The article covers the role of leasing as a financial tool which ensures modernization of scientific and production technical bases of industrial enterprises. **Methods:** The similarity of long-term crediting conditions and financial leasing underlies the efficiency analysis of the leasing operations, which are carried out by the two main parties of the leasing transaction – the lessee and the lessor. A number of provisions on cash flow management were formulated starting from different types of taxes and considering the time factor. The formulated provisions were taken into account when developing a comparison model of leasing and loan. **Findings:** The authors have provided a brief overview of leasing schemes and a more detailed outline of the financial leasing scheme underlying the suggested computer models. The basic components of the leasing payments are considered in the context of the general guidelines which were formulated in "Methodical Recommendations on the Calculation of Lease Payments", elaborated by the Ministry of Economy of the Russian Federation. The basic components are supplemented with specific ones that affect the calculation of the lease payments. The two computer models were elaborated with the help of MS Excel spreadsheet processor based on financial models under consideration: the model for calculating the lease payments and the comparison model of leasing and loan. The suggested models are practically tested in relation to the implementation of the financial leasing scheme. It is shown that in addition to the organizational advantages in some cases, leasing can be more effective than a loan from the economic point of view as well, which is far from being obvious at first glance. **Application/Improvements:** Increased use of leasing is expected, which is determined by the import substitution policy and the need for companies to receive budget funds, to switch to new domestic equipment.

Keywords: Computer Modeling, Leasing, Financial Modeling, Modernization of Enterprises, MS Excel Spreadsheet Processor

1. Introduction

It is estimated that production funds of Russian industrial enterprises are considerably rundown, which significantly hinders the production of new competitive products. Implementation of the state program "Development of the Industry and Improvement of its Competitiveness" is aimed at tackling this issue. A radical modernization of the scientific and technological base of more than

1.5 thousand industrial enterprises has been scheduled in terms of this program. The main objective of the program is to prepare the domestic industry for the mass production of competitive products. In addition, it is expected that if this program is implemented in full, the multiplicative effect will reveal itself, because the technical re-equipment of enterprises will require the development and procurement of new machinery, equipment, tooling, etc. It would give impetus to the development of not only

* Author for correspondence

domestic machine-tool industry, but also, of chemical industry, metallurgy, metal processing, transport and other industries.

In modern conditions the technical re-equipment of enterprises is a complex multilayer process that requires solving complex problems, one of which is the search for sources of financing for new investments. Such investments can be carried out:

- at the expense of budgetary funds;
- at the expense of own funds;
- by attracting bank loans;
- at the expense of partially own funds and bank loans;
- at the expense of leasing mechanisms.

In case of insufficient own funds and if there is a lack of sufficient budget financing, company management usually faces a dilemma whether it is more profitable to lease fixed assets or to purchase them at the expense of a bank loan.

A variety of terms and conditions of leasing operations stipulates the necessity of justifying the decision on whether to use the leasing deals. Financial computer models may be an effective tool to justify such decisions.

2. Literature Review

One of the most complex elements of designing and preparing leasing transactions is to define the amount of lease payments, as well as a quantitative comparison of leasing and loan cost-effectiveness. These tasks represent a variety of problems of financial mathematics, which can be solved, on the one hand, by using common approaches and methods of cash flow analysis and, on the other hand, by taking into account specific characteristics of leasing deals.

Recently, due to significant formalization of the modern theory of finance, a range of issues dealt with in financial mathematics as well as the methods of solving them has been considerably expanded.

The basics of classical financial mathematics and its use in various business areas are covered in numerous literary sources, such as ¹⁻¹⁰ and others.

Various examples of stochastic models of financial mathematics can be found in ¹¹⁻¹⁶.

Specific features of calculations when conducting leasing operations are analyzed in ¹⁷⁻²².

The issues of automating financial calculations and the

construction of computer models in MS Excel spreadsheet processor are examined in ²³⁻³⁰.

3. Methods

3.1 A Brief Overview of Leasing Operations

In general, leasing is a contract under which one party – the lessor (owner) transfers the right to use certain assets (buildings, constructions, equipment, transport and other) to another party – the lessee (tenant) within a certain period of time and under specified conditions.

Usually such contract stipulates making regular payment by lessee for the used property. On the expiration of the contract or in case of its early termination the property shall be returned to the lessor. However, leasing contracts often presuppose the right of the lessee to purchase the property at a reduced or depreciated value, or the conclusion of a new lease agreement.

Currently, various types of leasing each being characterized by its specific features are applied within the business environment of enterprises of military-industrial complex. The main varieties of leasing include:

- operational (service) leasing;
- financial (capital) leasing.

Other forms of leasing (leaseback, direct, share, revolving, subleasing and others) are variations of two basic forms of leasing - operational or financial.

Operating (service) lease is a lease agreement, the term of which is usually less than the full period of depreciation of the leased asset. Thus, the rent under the contract does not cover the full cost of the asset, which makes it necessary to lease it several times.

Operating leasing often involves the provision of various services for the installation and maintenance of the leased property, hence its second, often used name is service leasing. The cost of services though is included in the rent or is paid separately.

The main objects of operational leasing are fast depreciated types of equipment (computers, copiers, other office equipment, etc.), as well as a variety of vehicles (cars, trucks, airliners, sea transport).

An important feature of operating leasing is the right of lessee to early termination of the contract. This opportunity allows the lessee to get rid of obsolete equipment promptly and replace it by more technologically advanced and competitive one. In addition, in the event of adverse

circumstances, the tenant can quickly stop this type of activity by returning the relevant equipment back to the owner, and thus significantly reduce the costs associated with the liquidation or reorganization of production.

Characteristics of the operational leasing listed above stipulate higher rental charges than in case of financial leasing; availability of contract items dealing with the payment of penalties in the event of early termination of the lease; other conditions are designed to reduce the risk and to partially compensate it for the property owners.

Financial (capital) leasing is a lease agreement which, as a rule, presupposes complete depreciation of the leased asset.

The main objects of financial leasing are real estate (land, buildings), as well as the long-term means of production (technological line, machine tools, construction equipment, etc.).

Unlike operational leasing, the financial leasing does not allow the possibility of early termination of the lease, thereby significantly reducing the risk of the property owner. In financial leasing all costs of installation and maintenance of property are usually assigned to the lessee. Commonly, these contracts presuppose the right of the lessee to purchase the property on expiry of the contract at a reduced or depreciated value (this value may be purely symbolic, e.g. 1 RUB).

Classic financial leasing scheme is shown in Figure 1.

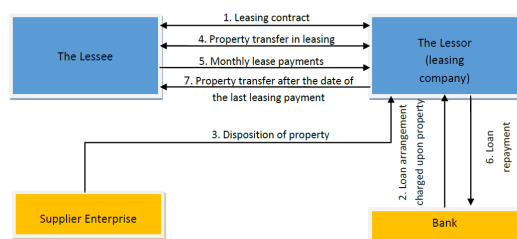


Figure 1. The financial leasing scheme.

Scheme annotations:

- The lessee selects the required property and it concludes the lease contract with the leasing company. The contract may stipulate an advance payment to lessor (usually 10-30% of the property value).
- The lessor, if he does not have enough own funds, gets a bank loan secured on purchased property.
- Lessor acquires the property from the enterprise-supplier specified by lessee.

- The lessor conveys acquired property to the lessee by signing the Act of property transfer on lease (lessee can obtain the equipment from the supplier by proxy from the lessor).
- The lessee makes monthly lease payments to the lessor.
- The lessor, in case the transaction was carried out by means of a bank loan, repays a loan in monthly installments from the funds obtained by leasing payments.
- Upon expiration of the lease contract after the last lease payment was made the lessor transfers the property into the ownership of the lessee.

Inherently, financial leasing is largely identical to the long-term bank loan, as it stipulates repayment in full of the equipment (loan) costs and making payments periodically, including the cost of equipment and the owner's income (loan payments includes the main part of the debt and the interest). As shown below, the similarity of conditions of long-term crediting and financial leasing underlies the procedures analysis of efficiency of leasing operations, which are carried out by the two main parties of the leasing transaction – the lessee and the lessor.

3.2 Method of Lease Payments Calculations

3.2.1 Key Components of the Lease Payments

Calculation of the lease payments is an extremely important stage of the leasing deal, since the final cost of leasing services is formed depending on its results. Calculation of economically feasible amount of payments provides the lessor with a certain level of profitability and the lessee is provided with a remunerative deal and an acceptable level of costs in specific conditions.

In almost every case the calculation of lease payments needs careful and individual approach that takes into account the specific factors of the ongoing leasing deal. However, there are some general guidelines that define the key components of the lease payments and the method of their calculation. Such provisions are fixed in the “methodical recommendations on the calculation of lease payments”, developed by the Ministry of Economy of the Russian Federation³¹.

In accordance with the methodical recommendations the leasing payments include:

- Depreciation of lease property for the whole duration of the lease contract;

- The fee for borrowing financial resources, attracted by the lessor for the implementation of the leasing deal;
- Commission to the lessor;
- The fee for the services provided by the lessor to the lessee for additional services, stipulated in the lease contract (for example, consulting, legal, marketing, technical, etc.);
- Redeemable value of property, if a leasing contract stipulates the redemption of the property at the agreed price.

Along with the above mentioned constituents the amount of taxes payable by the lessor is vitally important in calculating the lease payments, as well as fees for various forms of insurance (e.g., property passed to leasing, repossession lease payments, etc.) if they are carried out by the lessor.

Calculation of the lease payments will be done on the basis of the following conditions:

- upon expiration of a lease contract the property is transferred to the lessee at a conditional value of 1 rub. (i.e. redeemable value of property consisting of lease payments is ignored);
- the property which is transferred according to the lease contract carries on the lessor's balance sheet (i.e. the amount of property tax, along with the value added tax, is included in lease payments);
- the lessor and the lessee use the linear method of charging of depreciation for accounting and taxation purposes (taxation management uses special coefficient which is equal 3 for leased assets);
- insurance payments are not counted;
- lease payments are made monthly by equal installments (scheme of usual annuity).

Taking into account the considered constituents of lease payments, as well as the assumptions made, we will write the formula for calculating the total amount of lease payments as follows:

$$LP = D + IP + C + AP + PT + VAT \quad (1)$$

where, LP is the total amount of lease payments; D is an amount of depreciation payments (for tax purposes) IP is the amount of loan interest attracted by the lessor; C is lessor's commission; AP is a fee paid to the lessor for additional services under the lease contract PT is a property tax; VAT is value added tax.

Let us consider financial essence and the procedure for calculating the separate items forming a part of the lease payments.

3.2.2 Depreciation Charges

Depreciation charges on leasing property are carried out by the party of the lease contract, on the balance of which this property is (in the financial lease scheme the property is registered on the balance of the lessor).

When calculating lease payments one should distinguish methods of calculating depreciation in accounting and tax registration, while in the given scheme of financial leasing in both cases, we have adopted the linear depreciation method. The key difference in the way depreciation is charged is that tax legislation when it comes to the lease contracts stipulates preferential treatment for depreciation. In particular, article 259.3 of Tax code of the Russia Federation (tax code) stipulates the right of the parties of the lease contract to use accelerated depreciation with the factor not higher than 3, when using both linear and nonlinear depreciation methods. In accounting acceleration factor can be applied only if the depreciation of leasing assets is accrued by reducing balance method. If the depreciation is accrued by the linear method, the acceleration factor cannot be applied.

To be fair it should be noted that the tax legislation also has a number of restrictions on the use of the preferential accelerating factor of depreciation. So the preferential factor cannot be applied to fixed assets related to the first-third depreciation groups (fixed assets with a useful life term from 1 up to 5 years).

Monthly depreciation charges (for tax purposes) in the financial leasing scheme are calculated according to the formula:

$$D^1 = \frac{PC}{T^{UL}} \times 3 \quad (2)$$

where D^1 is a monthly depreciation; CP is the value of leased property (excluding VAT); T^{UL} is the useful life of property, months.; 3 – acceleration factor of depreciation.

Since a classic financial lease scheme assumes full depreciation of leased property, it should be expected that at the end of the lease contract the total amount of depreciation will be equal to the cost of the leased property, i.e.:

$$D = PC \quad (3)$$

The method of depreciation in accounting affects the amount of property tax, the procedure for the calculation of which is discussed below.

3.2.3 The Total Interest of the Loan

In this example, the total interest of loan obtained by the lessor for the acquisition of property shall be calculated on the basis of an ordinary annuity scheme, i.e. the loan is redeemed in equal installments at the end of each month (another common scheme is an equal redemption of principal with the interest payments on the remaining debt).

When calculating the lease payments and carrying out the subsequent comparison of the effectiveness of leasing and credit operations an important question arises: at what interest can the lessor allocate credit resources? It is usually assumed that the interest rate is the same for all parties involved – the lessor and the lessee. However, in fact it is perhaps even more likely to be wrong: many leasing companies, including large ones, are established as a subsidiary in relation to the structure of the banks, respectively, passive interest rate of credit resources for such companies can be significantly lower than market rates on loans, which are available for companies-borrowers.

3.2.4 The Commission to the Lessor

The commission to the lessor is calculated on the basis of the return rate (the leasing margin), which leasing company requires to be paid on account of their costs and making a profit (usually 3-7%). As a rule, the percentage margin is accounted for the amount of residual value of the leased property at the beginning of the year (according to tax registration):

$$C_i = RC_i^{TA} \times LM \quad (4)$$

where, is the residual value of the asset at the beginning of the RC_i^{TA} 1st year (according to the tax registration); LM -leasing margin (Commission fee), %

3.2.5 Payment to the Lessor for Additional Services

Additional services fee is calculated in each case individually and covers costs from the lessor to the lessee to provide consulting, legal, marketing, technical and other services.

3.2.6 Property Tax

In the diagram, the asset is taken into account on the balance sheet of the lessor, a property tax, which the leasing company must pay, is also included in the calculation of the lease payments.

When calculating property tax residual value of assets, calculated according to accounting (not tax) account, is taken into account. This provision is based on article 375 of the tax code, which stated that, in determining the tax base the property, which is subject to taxation, is recognized by its residual value, which is formed in accordance with the established accounting procedures, approved by the accounting policy of the organization. Thus, the amount of property tax affects depreciation method adopted in accounting, and this method differs from the accelerated method of depreciation for tax purposes, which was discussed above.

Property tax is paid annually by the lessor and is calculated according to the formula:

$$PT_i = \frac{RC_{by_i}^{B.A} - RC_{ey_i}^{B.A}}{2} \times rPT \quad (5)$$

where, - is the residual value of the asset at the beginning of the $RC_{by_i}^{B.A}$ 1st year (accounting data); -the residual value of the asset at the end of the $RC_{ey_i}^{B.A}$ 1st year (accounting data); rPT -property tax rate, % (in accordance with article 380 of the tax code tax rates are set by the laws of the subjects of the Russian Federation and may not exceed 2.2%).

3.2.7 Value Added Tax

The lessor who applies the general taxation system, charges VAT on the principal amount of leasing payments. VAT is paid by the lessee on a monthly basis together with the principal amount of the payment. At the same time the lessee, applying the general taxation system, has the ability to take a deductible amount of VAT and, thus, to reduce the total amount of VAT payable to the budget. From the point of view of the lessee's cash flow, VAT on the lease payments has zero impact on the total cash flow in leasing scheme (amount to be paid to the leasing company – money outflows is also deductible, which means tax savings inflow).

Total VAT amount is determined by the formula:

$$VAT = LP_{-VAT} \times rVAT \quad (6)$$

where, LP_{-VAT} is the total amount of leasing payments of VAT ($= LP_{-VAT} LP_{-VAT} D + IP + C + AP + PT$);

$rVAT$ - value-added tax rate, % (currently 18%).

At the final stage the value of the monthly lease payment is calculated:

$$LP^1 = \frac{LP - A}{T} \quad (7)$$

where, LP^1 is the monthly lease payment of the lessee;

A is an advance payment of the lessee;

T is a term of lease contract, months.

3.3 Methods for Comparison of Leasing and Loan

The above mentioned methods of calculating lease payments specify the calculation of the lessor, which in fact are usually not disclosed and are hidden for the lessee. Payment schedule (plan) of leasing contributions is open information for the lessee. It should be compared with the schedule (plan) of the repayment of the loan. On the basis of the comparison the following question can be answered: "what is more advantageous – leasing or loan?"

Before proceeding to a quantitative comparison of economic efficiency of leasing and loan, it should be noted that leasing has some institutional advantages over loan, which may in some cases be a decisive factor in choosing a source of funding, even if the loan will have some economic advantage over the lease. The organizational advantages of leasing include:

- Leasing offers more availability for customers.
- Leasing companies have far less tough requirements for clients and do not require additional collateral. For many businesses, leasing is the only opportunity to purchase new property.
- Leasing contract has longer term.
- Possible term of loan agreement is usually from 6 to 36 months. The term of the lease contract can go up to 60 months or more.
- Flexible payment terms.
- Lease provides the parties with an opportunity to develop convenient payment scheme. This scheme can take into account the seasonality of the client's business, assuming in equal payments.
- Retention of stable indicators of financial stability of the enterprise.

Unlike credit operations, lease ones in most cases are not reflected in the lessee's balance sheets, since the leasing company legally remains the owner of the assets; it calculates depreciation and pays property taxes.

Along with the institutional advantages in some cases leasing may be more efficient than loan from the economic point of view, what might be far from being clear at first glance.

When developing comparison model of leasing and loan the following provisions must be taken into account:

- When purchasing equipment on credit and when purchasing it on lease company has the opportunity to recover VAT paid in case of loan as part of the equipment cost, and when leasing it is paid as a part of lease payments. It should be noted that when purchasing equipment on credit a lessee pays the VAT immediately in full, while in case of leasing VAT payment is being made within the leasing agreement with each lease payment.
- When purchasing equipment on credit a company pays the tax on the property annually. When purchasing equipment on lease property a tax is included in lease payments.
- When purchasing equipment on credit and when purchasing it on lease income tax recovery arises:
 - when purchasing equipment on credit income tax recovery arises, which is formed by three tax shields: interest, depreciation, tax on property. Monthly income tax recovery in case of loan is calculated by the formula:

$$SIT_{Credit}^1 = (D^1 + IP^1) \times rIT \quad (8)$$

where, IP^1 is the loan interest payment; rIT -profit tax rate, % (currently 20%).

In the 12-th, 24th, etc. payment periods the formula (8) includes property tax:

$$SIT_{Credit}^1 = (D^1 + IP^1 + PT) \times rIT \quad (9)$$

- lease payments (excluding VAT) reduce the taxable base on income tax in full. Monthly income tax recovery in case of lease is calculated by formula:

$$SIT_{Leasing}^1 = LP_{-VAT}^1 \times rIT \quad (10)$$

- The above mentioned payments and earnings are

differently distributed in time; therefore, the time factor should be taken into account for meaningful comparison of summary costs. Consequently, when comparing leasing and loan it is necessary to compare discounted payment flows, i.e. the flows modified to the starting time. More profitable scheme is a financial one that provides a smaller present worth of PV cash flow arising in the course of its transfer, i.e. the following rule works:

if $PV_{Credit} < PV_{Leasing}$ - purchase on credit, otherwise purchase on lease

4. Results

4.1 Computer Model for Calculating Lease Payments

4.1.1 Task Statement

The enterprise, which requires special equipment, applies to the leasing company. Equipment costs (including VAT) 200000 notional currency units. Standard operation time is 6 years. The enterprise possesses free own funds to purchase equipment at a rate of 20000 notional currency units.

It is necessary to calculate the amount of the monthly lease payments and make a leasing payment schedule of installments on the basis of the following conditions:

- lease payments are made monthly, by equal installments;
- the method of depreciation for accounting and tax registration is linear (for tax purposes using special factor equal to 3).
- lease term is 24 months (corresponding to the term of full amortization of the leased asset when used for tax purposes of the linear method of depreciation to the acceleration factor of 3, that is $6 \times 12/3 = 24$);
- conditions of attraction of credit resources: loan term is 24 months; interest rate is 15% per annum, accrued on a monthly basis; the loan is repaid in equal installments at the end of each month (ordinary annuity scheme).
- the size of commission (leasing margin) is 3% per annum of the residual value of the asset at the beginning of the year (according to tax registration);
- additional services of the lessor – 5000 notional

currency units (consulting, travel expenses, equipment delivery, etc.);

- equipment is recorded on the lessor's balance sheet;
- property tax rate is 2%.

4.1.2 The Solution of the Problem

To solve this problem, we have developed a computer model to calculate lease payments in MS Excel spreadsheet processor. The model is developed on three worksheets:

- "lease payment" sheet is designed to calculate the value of the monthly lease payment, the value of which is determined in notional currency units (Figure 2);
- "Lessor's Loan" sheet is a subsidiary and is designed for calculating the amount of interest on loans taken by the lessor for the acquisition of equipment (Figure 3);
- "leasing plan" sheet is designed for scheduling the installments of lease payments (Figure 4)

The following abbreviations are used in Figure 3: PV - present value (the principal); r - interest rate on the loan; n - the credit period, years; m - interest accruals per year; FV - the future value ($FV = 0$, since the full repayment of the loan is expected within a reasonable time); CF - the value of periodic payments; CFP - the value of periodic payments of principal; CFI - the value of periodic payments of interest on the part of the debt.

Thus, the calculated monthly lease payment is 9847.18 notional currency units (including VAT 1502.11 notional currency units).

4.2 Computer Model comparing Leasing and Loan

4.2.1 Task Statement

Enterprise, which applies to the leasing company for the equipment acquisition, is considering an alternative source of financing i.e. a bank loan.

Terms of loan

- loan term is 24 months;
- the interest rate is 15% per annum, monthly accrual;
- the loan is repaid in equal installments at the end of each month (ordinary annuity).

It is necessary to determine which scheme of funding source allocation is the more profitable for the firm: leasing or loan.

Initial data			
Data on equipment			
Price (VAT included)	200,000.00		
Useful life term (month)	72		
Lessee's funds			
Proprietary funds	20,000.00		
Insufficient payment	180,000.00		
Leasing terms			
The term (month)	24		
The factor of accelerated depreciation charge	3		
Leasing margin	3%		
Calculation of the lease payments			
The value of the asset (excl. VAT)	169,491.53		
Monthly depreciation charges	7,062.15		
The amount of interest on a loan	29,462.32		
Commissions			
1st year	5,084.75		
2nd year	2,542.37		
Total	7,627.12		
Balance sheet value	the beginning of the year	the end of the year	in average
1st year	169,491.53	141,242.94	155,367.23
2nd year	141,242.94	112,994.35	127,118.64
Property tax			
1st year	3,107.34		
2nd year	2,542.37		
Total	5,649.72		
Additional services	5,000.00		
Lease payments in total (without VAT)	21,7230.68		
VAT Amount:	39,101.52		
The total amount of leasing payments	25,6332.20		
Advance payment	20,000.00		
Monthly payment	9,847.18		

Figure 2. "Lease Payments" sheet.

PV	r	n	m	CF	FV
-180,000.00	15%	2	12	8,727.60	0.00
# period (month)	CFP	CFI	CF		
1	6,477.60	2,250.00	8,727.60		
2	6,558.57	2,169.03	8,727.60		
- // - // -	- // - // -	- // - // -	- // - // -		
24	8,619.85	107,75	8,727.60		
Total	180,000.00	29,462.32	209,462.32		

Figure 3. "Lessor's Loan" sheet.

# period (month)	Lease payments
1	9,847.18
2	9,847.18
- // - // -	- // - // -
24	9,847.18
Total	23,6332.20

Figure 4. "Leasing Plan" sheet.

4.2.2 The Solution of the Problem

To solve the problem, we will develop a computer model of repayment of the loan under the scheme of an ordinary annuity ("Credit Plan" sheet, at the initial stage this list is similar to "Lessor's Loan" sheet, Figure 3). The calculations show that the total amount of payments on the loan (209,462.32 notional currency units) is less than the total amount of lease payments (236,332.20 notional units). However, such comparison of leasing and loan is flawed because it does not take into account tax optimization. It is a reduction of tax payments that makes leasing in some cases more effective than a loan from the economic point of view.

For a correct solution of the problem we will develop a computer model of a comparison of leasing and loan. The proposed model is an add-in on the platform of the previously developed model (paragraph 4.1.2), which takes into account all of the above discussed provisions to ensure a valid comparison of leasing and credit schemes. In particular, these are the following changes in the previously built model:

- the VAT calculation formula on the savings and on income tax in the case of leasing financing scheme is added on the "Leasing Plan" scheme (Figure 5);
- the formula for the calculation of depreciation, property tax and save for income tax in the case of credit financing scheme is added on the "Credit Plan" sheet (Figure 6);
- a new "Scheme Comparison" sheet is added (Figure 7), which, taking into account the discounting of payment flows compares leasing and loan schemes.

The calculations show that the actual (reduced) cost of the loan exceeds the similar costs of leasing, therefore, the purchasing of equipment on lease scheme is more attractive to businesses.

# period (month)	Lease payments	VAT (Recoverable)	Savings on income tax
1	9,847.18	1,502.11	1,669.01
2	9,847.18	1,502.11	1,669.01
- // - // -	- // - // -	- // - // -	- // - // -
24	9,847.18	1,502.11	1,669.01
Total	23,6332.20	36,050.68	40,056.31

Figure 5. "Leasing Plan" sheet.

PV	r	n	m	CF	FV	
-180,000.00	15%	2	12	8,727.60	0.00	
# period (month)	CFP	CFI	CF	Depreciation Charges	Property tax	Savings on income tax
1	6,477.60	2,250.00	8,727.60	2,354.05		920.81
2	6,558.57	2,169.03	8,727.60	2,354.05		904.62
- // - // -	- // - // -	- // - // -	- // - // -	- // - // -	- // - // -	- // - // -
12	7,426.07	1,301.52	8,727.60	2,354.05	3,107.34	1,352.58
13	7,518.90	1,208.70	8,727.60	2,354.05		712.55
- // - // -	- // - // -	- // - // -	- // - // -	- // - // -	- // - // -	- // - // -
24	8,619.85	107,75	8,727.60	2,354.05	2,542.37	1,000.83
Total	180,000.00	29,462.32	209,462.32	56,497.18	5,649.72	18,321.84

Figure 6. "Credit Plan" sheet.

Indicator	The financial scheme	
	Purchase on credit	Purchase on lease
Own funds (advance payment)	20,000.00	20,000.00
Payout Amount	193,948.35	218,828.10
Property tax	5,072.75	
Recoverable VAT	30,508.47	33,380.57
Savings on income tax	17,056.42	37,089.53
Actual costs	171,456.20	168,358.10

Figure 7. "Scheme Comparison" sheet.

5. Discussion

Currently, the market offers a lot of specialized software solutions for the financial modeling. Most of these programs are distributed on a commercial basis and include wholly or partially closed source code of the financial model itself.

The models based on the platform of the MS excel spreadsheet processor are an alternative to a "closed" model of specialized financial programs. The main advantage of such models is their transparency and flexibility. At any moment the user can see the formula for the calculation of this or that indicator, if necessary, to modify its features with regard to the simulated business process.

However, it should be noted that simulation of complex business processes in MS Excel can cause significant difficulties. This is particularly evident in situations when you want to "play" different scenarios of development of business processes (to change the strategy of financing, terms of payment for materials, sales charts, etc.), to carry out a sensitivity analysis of financial indicators, generate detailed reports in various time intervals. To implement this functionality seems difficult for non-programming MS Excel users, so in this case, in our opinion, it is more preferable to use specialized software.

6. Conclusion

In modern conditions the modernization of the enterprises is a complex multidimensional process that requires solving complex problems, one of which is the search for new sources of financing for investment. The solution of this problem entails the need for effective management approaches and mechanisms, adequate socio-economic situation in the country at this point in

time, and meeting modern requirements. Leasing is one of these tools ensuring the modernization of the scientific and technological base of enterprises. In the coming years, it is likely to expect an increase in the use of leasing, which is determined by the policy of import substitution and the need for companies to receive budget funds, to switch to new domestic equipment (by 2020 the share of new domestic equipment at the enterprises receiving budget funds should not be less than 60%).

7. Acknowledgement

The study has been carried out with the support from the Russian Science Foundation (RSF project No. 14-18-00519).

8. References

1. Joshi M. The concepts and practice of mathematical finance. Cambridge University Press; 2008.
2. Roberts AJ. Elementary calculus of financial mathematics. Society for Industrial and Applied Mathematics; 2009.
3. Omidzadeh D. Optimization of customers credit evaluation for Iran Khodro leasing company using the neural network algorithm. Indian Journal of Science and Technology. 2015 Oct; 8(28). DOI: 10.17485/ijst/2015/v8i28/81887.
4. Amirbekova D. The knowledge competence development and use of information technologies in small and medium-sized enterprises in Kazakhstan. Indian Journal of Science and Technology. 2016 May; 9(20). DOI: 10.17485/ijst/2016/v9i20/94475.
5. Gerver RK, Sgroi RJ. Financial algebra. Cengage Learning; 2010.
6. Cleaves C, Hobbs M, Noble J. Business math. Prentice Hall; 2011.
7. Ross MR. An elementary introduction to mathematical finance. Cambridge University Press; 2011.
8. Bolviken E. Computation and modelling in insurance and finance. Cambridge University Press; 2014.

9. Avon J. The basics of financial modeling. Apress; 2015.
10. Evstigneev IV, Hens T, Schenk-Hoppe KR. Mathematical financial economics: A basic introduction. Springer; 2015.
11. Dokuchaev N. Mathematical finance. New-York: Routledge; 2007.
12. Vecer J. Stochastic finance: A numeraire approach. New-York: CRC Press; 2011.
13. Crepey S. Financial modeling: A backward stochastic differential equations perspective. Springer; 2013.
14. Chin E, Olafsson S, Nel D. Problems and solutions in mathematical finance, Vol. I: Stochastic calculus. New-York: Wiley; 2014.
15. Kennedy D. Stochastic financial models. New-York: Chapman and Hall/CRC; 2014.
16. Nicolay D. Asymptotic chaos expansions in finance: Theory and Practice. Springer; 2014.
17. Contino RM. The complete equipment-leasing handbook: A deal maker's guide with forms, checklists, and worksheets. AMACOM; 2002.
18. Shabashev VA, Fedulova AE, Koshkin AV. Leasing: fundamentals of theory and practice. Moscow: Knorus; 2005. [in Russian]
19. Gazman VD. Leasing. Financing and securitization. Moscow: Vysshaya Shkola Ekonomiki; 2011. [in Russian]
20. Alhabeed MJ. Mathematical finance. New-York: Wiley; 2012.
21. Filosofova TG. Leasing business. Moscow: UNITI-DANA; 2012. [in Russian]
22. Semenihin VV. Leasing. Moscow: Eksmo; 2012. [in Russian]
23. Sengupta C. Financial modeling using excel and VBA. Wiley; 2004.
24. Day A. Mastering financial mathematics in microsoft excel: A practical guide for business calculations. Prentice Hall; 2010.
25. Lai DCF, Tung HKK, Wong MCS et al. Professional financial computing using excel and VBA. Wiley; 2010.
26. Charnes J. Financial modeling with crystal ball and excel. John Wiley and Sons; 2012.
27. Fairhurst S. Using excel for business analysis, Wiley; 2012.
28. Benninga S. Financial modeling. The MIT Press; 2014.
29. Alastair D. Mastering financial mathematics in microsoft excel. FT Press; 2015.
30. Goossens F. How to implement market models using VBA. Wiley; 2015.
31. Guidelines for the calculation of lease payments, Minekonomiki RF; 1996 Apr 16. [in Russian].

