

Mobile Fleet Economic Efficiency Calculation in International Road Transport

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Abstract

Activity efficiency of economic entity in transport business considerably depends on appropriate mobile fleet choice. As a rule, reliable, having low exploitation costs and well-designed maintenance stations extensive network, trucks secure sound financial position for transport enterprises which carry out efficient organization of freight forwarding business. Mobile fleet purchase conditions are much worse than in European counties: leasing and credit rates are 3 – 4 times lower, and price itself is lower too. Our government decree which foresees disposal fee implementation makes the situation even worse. It's a serious issue and it should be solved, for under conditions of freight rates decrease, mobile fleet upgrading expenditures become more significant.

Keywords: Mobile fleet, upgrading expenditures, integrated investment, economic efficiency.

1. Introduction

International road transport mobile fleet manufacturers make trucks with similar technical specifications. Moreover, vehicle concordance to standard requirements of UNECE rules (there are 110 of them) and EU directives make construction parameters more similar. However, prices for vehicles by different manufacturers can vary in a substantially significant way. Consumers have issues with making right choice of mobile fleet. To solve this issue it's necessary to choose objective criterion and evaluate possible variants of vehicles according to it. Evaluation criterion must impartially assess mobile fleet efficiency. It should have meaning, meet requirements of all participants of automobile purchase and exploitation processes, and be easy and convenient for calculation, sufficient, reliable, comprehensive and replicable.

2. Materials and methods

Integrated investment economic efficiency assessment criterion - net current cost (NCC) meets all these requirements. Capital increase from investments is defined as a difference between total discounted cash flow and discounted investments amount. This value is net present value (NCC) and it indicates integrated effect from vehicle exploitation. NCC is calculated by formula:

$$NCC = \sum_{n=0}^{T_{cs}} DCF_n - \sum_{n=0}^{T_{cs}} DI_n, \quad (1)$$

where T_s – vehicle service life, years; DI_n – discounted investments of n year; n – year numerical order.

NCC is main investments economic efficiency assessment criterion. If $NCC > 0$, then investments are paid off within considered period, investments are put up in right way. When $NCC < 0$, project doesn't pay off. If $NCC = 0$, project is neither profitable nor unprofitable.

When applied it's often not possible to define revenues from new facility exploitation. For example, how can we evaluate road freighter economy efficiency, used in manufacturing chain of own production? When it's difficult to calculate tangible benefit from using new facility, it can be evaluated according to criterion - specified discounted net expenditures (SDNE), defined by formula

$$SDNE = \left(\sum_{n=0}^{T_{cs}} DPE_n + \sum_{n=0}^{T_{cc}} DI_n \right) / \sum_{n=0}^{T_{cs}} L_{year.n}, \quad (2)$$

where DPE_n – discounted present expenditures of n -period; $L_{year.n}$ – annual vehicle mileage of n -period;

In DPE_n – operating exploitation expenses are considered, which are defined by vehicle quality. This criterion is sum

of nonrecurring and current expenditures for vehicle service period, put on beginning of investment period.

$$DPE_n = DC \cdot \sum_{n=0}^{T_{ca}} CE_n, \quad (3)$$

where CE_n - current expenditures of n -period. Current expenditures can include service production cost with deduction of amortization expenses, balance profit tax, profit tax, license acquisition expenses, trucking company allowances and training expenditures.

Investment profitability is defined by formula

$$PI = \frac{\sum_{n=0}^{T_{ca}} DCF_n}{\sum_{n=0}^{T_{ca}} DI_n}. \quad (4)$$

Investments profitability shows total discounted cash flow per 1 RUB of discounted investments. Investments are profitable, if $PI > 1$. This condition is automatically performed when $NCC > 0$. Condition $PI > 1$ simultaneously shows, that expenditures for this project are paid off, and value PI equals multiples of payback. Naturally, within comparative analysis the biggest profitability is more preferred option.

Consumer is interested not only in pay off, but also in investment profitability which characterizes DAV . DAV - discounting rate value, which corresponds to zero value NCC , i.e. it is defined by equation

$$\sum_{n=0}^{T_{ca}} \frac{NCF_n}{(1+r)^n} - \sum_{n=0}^{T_{ca}} \frac{I_n}{(1+r)^n} = 0 \quad (5)$$

regarding discounting rate r .

If discounting rate r changes, NCC changes its mark from "+" to "-", and there's such rate, under which $NCC = 0$, and this rate is called DAV .

When applied equation (2.58) is solved via iteration, for this r gets different values and NCC is found until condition $NCC < 0$ is performed. DAV value is defined by equation

$$DAV = r_1 + \frac{NCC_1}{NCC_1 + |NCC_2|} \cdot (r_2 - r_1), \quad (6)$$

where r^1 - discounting rate, under which corresponding $NCC^1 > 0$; r^2 - discounting rate, under which corresponding $NCC^2 < 0$.

We can assess DAV value according to possibility to return credit sum, compare investment profitability with alternative investments. DAV shows maximal allowable limit of discounting rate. For example, investments are performed on account of loan for 20%, and $DAV=25\%$, which means that investment profitability is bigger than bank interest and credits with interest will be returned. For investment condition $DAV > "CC"$ (capital cost for enterprise) is needed to be performed.

Vehicle pay off can be defined by two ways: according to net cash flow without considering time factor (P - payback) and discounting cash flow (CP - current pay off). To calculate payback, cash flow is added till the sum exceeds investment value. Year within which it exceeds is investment pay off period. Consumer compares obtained payback term value with alternative investments and makes decision to purchase vehicle. If consumer invested on account of credit, then payback term shouldn't exceed loan repayment term in case it will be returned only out of vehicle exploitation profits.

P - pay off doesn't consider time value of money. This indicator enables to find out how much time will be needed for investment to bring in such sum of money which was spent on it without considering discounting influence. If for company pay off period matters, then this indicator can be used as "barrier". If pay off term is longer than barrier one, project will be rejected. After initial expenses indemnity, pay off ignores cash flow. This method prefers cash flows generated in first years.

Pay off indicator is not used separately, only as addition to other number indices - NCC , PI and DAV .

Investments pay off can be defined in current costs, i.e. using discounted cash flow (DCF). Pay off calculated according to DCF is called current pay off (CP - pay off). In this case time factor and "barrier rate" are considered. Naturally, current pay off is bigger than pay off calculated according to net current costs. CP can be calculated by formula

$$TO = m + \frac{\sum I - S_m}{P_{m+1}}, \quad (7)$$

where S^m - cash flow sum for m years, under which condition $S_m < \sum I < S_{m+1}$; P_{m+1} - cash flow in $(m+1)$ - year is performed.

We will study special features of economic efficiency calculations on actual example. Chelny Trucks Ltd is set up to provide transport services to freight cargos internationally on route «Naberezhnye Chelny – Munich (Germany) – Naberezhnye Chelny». This enterprise has permission to perform international forwarding and is full member of AIRTC (Association of International Road Transport Carriers). To perform international forwarding truck KAMAZ-5460 with semitrailer Krone is bought. Truck is loaded with 20 tons of 1-st class cargo. Crew, consisting of two drivers, works on mobile fleet. Cast products are exported; roll paper for printing industry is imported. Described route will be the same for eight years.

Planned round trip duration is 384 hours. Transportation is regularly performed within a year. Market capacity is 19 round trips per year. One truck will forward 1500 tons of cargo. Rate quotations shall be negotiated.

The shortest distance in export direction:

Naberezhnye Chelny – Kazan – Moscow– Smolensk (1528 km) – Kozlovichi (Belorussia) (679 km) / Kukuryki – Svitsko (Poland) (730 km)/ Frankfurt (Oder) – Munich (Germany) (770 km);

The shortest distance in import direction:

Munich – Frankfurt (Oder) (Germany) (770 km)/ Svitsko – Kukuryki (Poland) (730 km)/ Kozlovichi (Belorussia) – Smolensk (679 km) – Moscow – Kazan – Naberezhnye Chelny (1528 km).

Total distance is 7414 km, including on the territory of Germany – 1540 km, on the territory of Poland – 1460 km, on the territory of Belorussia – 1358 km, on the territory of Russia – 3056 km.

Border crossing: Smolensk, Kozlovichi, Frankfurt (Oder).

Cash flow calculation on truck exploitation is shown in chart 1, and economy efficiency indicators calculations on truck exploitation KAMAZ-5460 with semitrailer Krone are shown in chart 2.

Thus, according to economic criteria NCC, DNE, PI, DAV, due to pay-off it's possible to objectively evaluate mobile fleet efficiency and make right choice. The method can be used while assessing efficiency of trucks bought on loan or lease. In this regard corresponding corrections are put into cash flow calculation chart. Offered method respects the interests of all international road transport participants.

According to practice and calculations, more expensive imported vehicles are not paid off within reviewed exploitation period [Fashiev, Ildarhanov & Krahmaleva, 2004]. Some specialists explain this fact by low competitive ability of home forwarders. Competition on international road transport services market has considerably become more strained. It's especially noticeable under conditions of economy pace and foreign trade activity decrease in many counties. Competitive ability of international forwarders is known to depend on many factors.

Chart 2.1: Cash flow calculation from truck exploitation, RUB thousands.

Indicator	Years									
	0	1	2	3	4	5	6	7	8	
1	2	3	4	5	6	7	8	9	10	
1. Investments										
1.1. Truck	1100									
1.1.0. VAT on truck	198									
1.2. Semitrailer	400									
1.2.0. VAT on semitrailer	72									
1.3. Recording tachometer	21									
1.3.0. VAT on recording tachometer	3									
1.4. Communication facilities	5									
1.4.0. VAT on communication facilities	0,9									
1.6. Working assets	346									
1.7. VAT on working assets	62									
1.8. Expenses on gaining license, vehicle permission	6,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
1.9. Entry cost to AIRTC	77									
1.10. Infrastructure expenses	0									
1.11. Training expenses	7					7				
1.12. Other nonrecurring expenses	10									
Total investments	1973									
2. Profits. Expenses. Taxes.										
2.1. Round trips quantity		19	19	19	19	18	18	17	17	

2.2. Rate for 1 round trip		280	280	280	280	280	280	280	280
2.3. Operating income without VAT		5320	5320	5320	5320	5040	5040	4760	4760
2.4. VAT (0% from operating income) gained		0	0	0	0	0	0	0	0
2.5. Services production cost		4774	4800	4829	4859	4492	4485	4339	4375
2.5.1. Fuel expenses		1539	1570	1601	1634	1578	1610	1551	1582
2.5.1.0. VAT		277	282	288	294	284	289	279	284
2.5.2. Lube and technical fluids expenses		90	92	94	96	92	94	91	93
2.5.2.0. VAT		16	16	16	17	16	17	16	16
2.5.3. Tires expenses		142	142	142	142	134	134	127	127
2.5.3.0. VAT		25	25	25	25	24	24	22	22

Chart extension 2.1

1	2	3	4	5	6	7	8	9	10
2.5.4. Maintenance and repair expenses		181	184	188	192	185	189	182	186
2.5.4.0. VAT		32	33	33	34	33	34	32	33
2.5.5. Drivers salary		480	480	480	480	480	480	480	480
2.5.6. Social security contributions		127	127	127	127	127	127	127	127
2.5.7. Carrier services expenses		532	532	532	532	504	504	476	476
2.5.8. Rental payments									
2.5.8.0. VAT									
2.5.9. "Green card" insurance		16	16	16	16	16	16	16	16
2.5.10. Medical insurance		4	4	4	4	4	4	4	4
2.5.11. Carnet TIR purchase expenses		61	61	61	61	58	58	55	55
2.5.11.0. VAT		11	11	11	11	10	10	9	9
2.5.12. Transit permission expenses		9	9	9	9	9	9	8	8
2.5.12.0. VAT		2	2	2	2	2	2	2	2
2.5.13. International passports and visas expenses		4	2	2	2	2	4	2	20
2.5.14. Truck amortization		263	263	263	263	46	0	0	0
2.5.15. Semitrailer amortization		33	33	33	33	31	31	29	29
2.5.15.1. Recording tachometer amortization		3	3	3	3	3	3	3	3
2.5.15.2. Communication facilities amortization		0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6
2.5.16. Road charges		79	79	79	79	75	75	71	71
2.5.17. CMR expenses		1	1	1	1	1	1	1	1
2.5.17.0. VAT		0,25	0,25	0,25	0,25	0,24	0,24	0,22	0,22
2.5.18. Speed diagram expenses		0,38	0,38	0,38	0,38	0,36	0,36	0,34	0,34
2.5.18.0. VAT		0,06	0,06	0,06	0,06	0,06	0,06	0,06	0,06
2.5.19. Frontier charges		40	40	40	40	38	38	36	36
2.5.20. Daily subsistence for drivers		129	129	129	129	122	122	116	116
2.5.21. Lodging allowance for drivers		407	407	407	407	385	385	364	364
2.5.21.0. VAT		13	13	13	13	12	12	12	12
2.5.22. Communication expenses		25	25	25	25	25	25	25	25
2.5.22.0. VAT		4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5

Chart extension 2.1

1	2	3	4	5	6	7	8	9	10
2.5.23. Optional insurance (MOD insurance)		37	28	20	12	4	3	3	3
2.5.24. Membership fees in AIRTC		8	8	8	8	8	8	8	8
2.5.25. Representational expenses		10	10	10	10	10	10	9	9
2.5.26. Additional charges		528	528	528	528	528	528	528	528
2.5.26.0. VAT		47	47	47	47	47	47	47	47
2.5.27. Tax for vehicle owner		17	17	17	17	17	17	17	17
2.5.28. Credits interests									
2.5.29. Land fee									
2.5.30. Lease payments									
2.6. Services operating profit		545	519	490	460	547	554	420	384
2.7. Income and expenses due to assets disposal									

2.8. Non-operational income and expenses									
3. Balance profit		545	519	490	460	547	554	420	384
4. Balance profit taxes		37	31	25	19	13	11	10	9
4.1. Property tax		37	31	25	19	13	11	10	9
5. Taxable income		507	487	464	441	533	543	410	374
6. Business tax		121	116	111	105	128	130	98	89
7. Net profit		385	370	353	335	405	412	311	284
Cash flows correction									
8. Current assets change		0	0	0	0	18	0	18	309
9. Credits interests									
10. Depreciation allocations		300	300	300	300	81	34	33	33
11. Depreciable value of working assets									419
12. Net cash flow NCF	-1973	684	669	652	634	496	446	361	1045
13. Discounting coefficient (DC)									
DC within r = 70%	1	0,58	0,34	0,20	0,12	0,07	0,04	0,02	0,01
14. Discounting cash flow (DCF)									

Chart extension 2.1

	1	2	3	4	5	6	7	8	9	10
DCF within r = 70%	-1973	402	231	133	76	34	18	8	8	14
15. DCF increasing within r =70%	-1973	-1571	-1339	-1206	-1130	-1095	-1077	-1068	-1054	
16. DC within r = 20%	1	0,83	0,69	0,58	0,48	0,4	0,33	0,28	0,23	
17. DCF within r = 20%	-1973	568	461	378	304	198	147	101	240	
18. DCF increasing within r =20%	-1973	-1405	-943	-565	-261	-62	85	186	426	
19. Net expenses	1973	4635	4650	4667	4685	4561	4593	4416	4443	
20. DC within r = 20%	1	0,83	0,69	0,58	0,48	0,4	0,33	0,28	0,23	
21. Net discounting expenses (NDE)	1973	3847	3208	2707	2249	1824	1515	1236	1021	
22. NDE increasing within r = 20%	1973	5821	9030	11737	13986	15811	17326	18563	19585	

Chart 2.2: Economic efficiency indicators from truck exploitation

Economic efficiency indicators	Value
1. NCC, RUB thousands.	426
2. SNDE, RUB/km	18
3. Investments profitability	1,22
4. Internal pay off coefficient, %	41,53
5. Current pay off term, years	5,3
6. Investments, RUB thousands.	1973

3. Conclusion

Main participants of transport business, which compete with home enterprises at our market, are forwarders from Poland and Baltic countries. They use modern facilities more efficiently and earn approx. 10-12 thousand euro per month due to high turnover of trucks. Most part of our forwarders can hardly reach 7 thousand euro [Online resource]. In European companies annual mean truck mileage exceeds 140 thousand km, and Russian ones is within 100 – 110 thousand km.

Mobile fleet purchase conditions are much worse than in European counties: leasing and credit rates are 3 – 4 times lower, and price itself is lower too. Our government decree which foresees disposal fee implementation makes the situation even worse. It's a serious issue and it should be solved, for under conditions of freight rates decrease, mobile fleet upgrading expenditures become more significant. Moreover, many of our forwarders consider heavy tax burden to be reason of their low competitive ability.

It's good that majority of international forwarders has got used to work and withstand difficulties. Even in this situation our leading enterprises are actively developing. Such conclusion is related to mobile fleet upgrading too. Within 2013 Russian international forwarders have acquired approx. 3 thousand of new trucks made by foreign manufacturers [Online resource].

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