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## COMPANY'S SOURCE OF FINANCING VALUATION USING STRATEGIC REAL OPTION APPROACH

*The article is devoted to the investigation and evaluation of the company expanded NPV depending on its available financing options using real option approach that synthesize the newest developments in corporate finance and real options and game theory. It enables to estimate the value of managerial decisions, and thus is suitable to valuing strategy and its flexibility.*

**Keywords:** strategic real options, game theory, strategic planning, strategy valuation, real option effect, expanded net present value (ENPV), discounted cash flow (DCF), terminal value (TV), free cash flow to equity (FCFE), exercise value (EV).

**Problem description and the analysis of the last publications.** Any project whether it is launching or developing requires financing, that in most cases is covered by own funds just partially, whereas the rest of by attracted facilities. On the other hand, financing attraction varies in different forms, such as loan, mezzanine, equity financing, or even concluding forward contracts. Therefore, the dilemma of better choice between available financing options almost exists [1].

Correct decision thus is especially important as a real option implies the value that includes any direct and indirect costs and benefits connected with using such an option, besides its direct influence on investment attractiveness ratios and ultimate valuation of a project. Moreover, since financing attraction requires a valid business valuation, the real option effect is an integral part of any calculations connected with such.

By and large, corporate or strategic real option models synthesize the newest developments in corporate finance and real options and game theory to help bridge the gap between traditional corporate finance and strategic planning [7]. It enables to estimate the value of managerial decisions, and thus is suitable to valuing strategy and its flexibility [5; 6].

**Purpose of investigation.** The purpose of our investigation is to assess the company expanded Net Present Value (ENPV) depending on its available financing options using simplistic real option method that does not conclude to Black-Scholes approach whereas direct and indirect costs reflecting only.

**Methodology description and main results of the research.** In pursuit of its decision-making goals, real-options modeling conclude into ENPV, rather than simple NPV, that is much more relevant base for either a feasibility study of any project, an

investment and managerial decision. The key here is that ENPV criterion incorporates, along with simple NPV of expected cash flows from an immediate investment, the flexibility of the combined options embedded in the project [7].

In our modeling we apply DCF (Discounted Cash Flow) approach rather than standard NPV one as its analog [3]. Fundamental difference between them, from the one hand, is that in the first case we can apply different discount rate through analyzed periods whether the latter applies single discount rate (left-site part of DCF Value formula below). From the other hand, using DCF valuation we apply Terminal Value (TV, right-site part of DCF Value formula below) that is the present value at a future point in time of all future cash flows when we expect stable or perpetuity growth rate forever. TV is most often used in multi-stage cash flow analysis and allows for the limitation of cash flow projections to a several-year period.

$$DCF\ Value = \sum \frac{FCFE}{(1+r)^n} + TV \quad (1)$$

where, FCFE (Free Cash Flow to Equity) is the cash flow paid to the equity shareholders of the project after all expenses, reinvestment and debt repayment where

$$TV = \frac{1 - \frac{1}{(1+r)^n}}{r - growth\ rate} \times \frac{CF}{(1+r)^n} \quad (2)$$

Having modified NPV, i.e. DCF Value, we assess Exercise Value (EV) of each option that is the present value of managerial decisions including all direct and indirect costs connected with each of them. Combining modified NPV with EV we adjusted to Expanded NPV.

$$ENPV = \sum \frac{FCFE}{(1+r)^n} + TV + EV \quad (3)$$

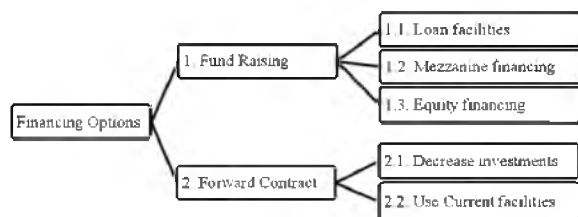


Fig. 1. Financing Options decision tree

The company considered three development options which are basement for further capital expenditure (CapEx) and all consecutive calculations including available forms of financing, these are:

1) company follows its investment plan without any delay in development with funds required to be raised in the amount of USD 7,4 mln;

2) company decreases investments within current year (0 period) up to USD 2,4 mln by postponing it for the consecutive period (I period);

3) company delays its development based on new equipment purchase until the consecutive period and keeps on working on old (further – Current) facilities.

Basing on the development options, two fundamentally different financing options available to the

Company are common fund raising and concluding forward contract with five subsequent options showed on the fig. 1.

In the table 1 Company's financing options are decrypted by the key distinctive constituents.

We applied present value approach with regard to all cash inflows and outflows used in fund raising expense calculations, options exercise value and Company expanded value (ENPV) estimation.

From the tables 2 and 3 showed below we can see the exercise value of a particular financing option and its impact on Company valuation respectively. Behind that, it becomes clear the ENPVs are also depended on Total Discounted FCFE measure, though in a smaller degree.

Basing on the available financing options and Company ENPV respectively, we can resume that the most appropriate option to choose is 2.2. – concluding forward contract with delay in development until the consecutive period and keep on working on the current facilities, that is depicted on the figure 2.

By and large, real options valuation brings about a clear conclusion that the most beneficial choice is using forward contract financing. To understand

Table 1. Financing Options Description

Financing Options	1 Common Fund Raising	2 Concluding Forward Contract
1.1.	Raising loan facilities by 15,0% rate per annum	-
1.2.	Attraction of mezzanine financing based on IRR 30,0 % cost	-
1.3.	Attraction of equity financing based on IRR 40,0 % cost	-
2.1.	-	Financing through concluding forward contract with a 5,0 % discount in price, 2,5% insurance rate
2.2.	-	Financing through concluding forward contract with a 10,0% discount in price, 2,5 % insurance rate, 10% production losses

Table 2. Options Exercise Value Assessment

FinancingOptions	1.1.	1.2.	1.3.	2.1.	2.2.
Initial fund raising expense, mln USD	(0,40)	(0,40)	(0,40)	(0,97)	(0,62)
CapEx debt service cost, mln USD	(1,24)	(2,23)	-	-	-
WorkCap debt service cost, mln USD	(0,12)	(0,03)	-	(0,80)	(0,19)
Other indirect costs, mln USD	-	(2,09)	(7,36)	-	(0,15)
Production losses, mln USD	-	-	-	-	(0,15)
Equity alienation, mln USD	-	(2,09)	(7,36)	-	-
Exercise Value, mln USD	(1,76)	(4,74)	(7,76)	(1,77)	(0,96)

Source: Author's calculations based on [1; 2].

Table 3. Company ENPV Valuation

FinancingOptions	1.1.	1.2.	1.3.	2.1.	2.2.
Company ENPV, mln USD	34,47	31,66	28,20	34,71	35,82
Total Discounted FCFE, mln USD	6,92	7,10	6,65	7,18	7,48
Exercise value, mln USD	(1,76)	(4,74)	(7,76)	(1,77)	(0,96)
Terminal value, mln USD	29,30	29,30	29,30	29,30	29,30

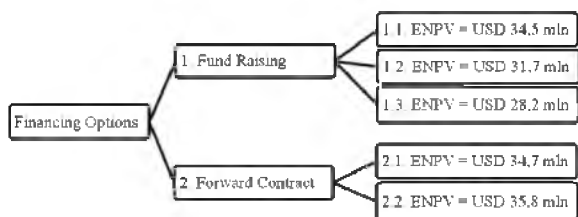


Fig. 2. Financing Options Decision Tree by ENPV

how real option approach helps us in decision making, we can depict ENPV by its constituents via decision tree showed on the figure 3.

**Conclusions.** We find out using real option approach is more appropriate method to assess a company value under various financing options existence and therefore much better tool for a decision-making than standard Net Present Value approach, that doesn't disclose all variables of an option in a proper manner and thus affects true profitability and investment attractiveness.

Further research potential includes but not limited by investment timing modeling in combine with dynamic modeling, as well as with other financial models. Moreover, different range of

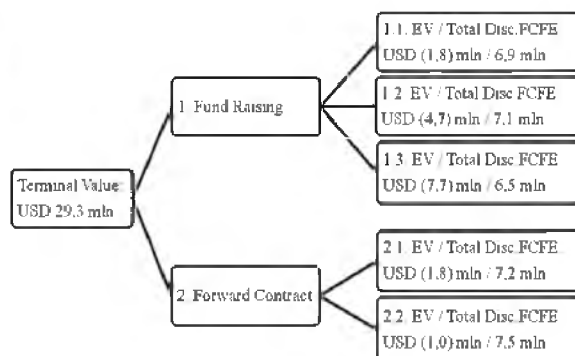


Fig. 3. Expanded Net Present Value Constituents

tools can be applied, i.e. synchronization of Excel-model with Matlab in terms of generation massive and random data, substitution method usage for consecutive sensitivity and Value at Risk analysis of the latter.

The upcoming work will synthesize strategic real options and Harry Markovitz's efficient portfolio approaches. Following the efficient portfolio approach we will use Expanded NPVs and Standard Deviations to analyze and pick up the best combination of both.

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## ОЦІНКА ВАРТОСТІ ДЖЕРЕЛ ФІНАНСУВАННЯ КОМПАНІЇ ЗА ДОПОМОГОЮ СТРАТЕГІЧНИХ РЕАЛЬНИХ ОПЦІОНІВ

*У статті досліджено та оцінено розширену чисту приведену вартість компанії (ENPV) залежно від доступних джерел фінансування за допомогою методики реальних опціонів, що є синтезом найновіших розробок в сфері корпоративних фінансів, реальних опціонів та теорії ігор. Використаний підхід дозволяє оцінити вартість управлінських рішень та відповідно здійснити оцінку стратегії та її гнучкість.*

**Ключові слова:** стратегічні реальні опціони, теорія ігор, стратегічне планування, оцінка стратегії, ефект реальних опціонів, розширена чиста приведена вартість (ENPV), дисконтовані грошові потоки (DCF), вартість постійного грошового потоку (TV), вартість вільного грошового потоку капіталу (FCFE), вартість виконання (EV).

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