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The dynamic model of choosing an external funding instrument

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Abstract: *Making a decision about using a specific funding source is one of the most important tasks of financial management. The utilization of external sources features numerous advantages yet staying aware of diverse funding options is not easy for financial managers. Today it is crucial to quickly identify an optimum possibility and to make sure that all relevant criteria have been considered and no variant has been omitted. Over the long term it is also necessary to consider the category of time as changes made today do not affect only the current variables but they also have a significant impact on the future. This article aims to identify the most suitable model of choosing external funding sources that would describe the dynamics involved. The first part of the paper considers the theoretical background of external funding instrument and of decision criteria. The making of financial decisions is a process consisted of weighing the most suitable variants, selecting the best variant, and controlling the implementation of accepted proposals. The second part analyses results of the research - decisive weights of the criteria. Then it is created the model of the principal criteria Weighted Average Cost of Capital (Dynamic model WACC). Finally it is created the Dynamic Model of Choosing an External Funding Instrument. The created decision-making model facilitates the modeling of changes in time because it is crucial to know what future consequences lies in decisions made the contemporary turbulent world. Each variant features possible negative and positive changes of varying extent. The possibility to simulate these changes can illustrate an optimal variant to a decision-maker.*

Key Words: *Dynamic Model, External Funding Instrument, Weighted Average Cost of Capital.*

1. Introduction

Making a decision about using a specific funding source is one of the most important tasks of financial management. The utilization of external sources features numerous advantages (Petřík, 2009) yet staying aware of diverse funding options is not easy for financial managers.

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Today it is crucial to quickly identify an optimum possibility and to make sure that all relevant criteria have been considered and no variant has been omitted. Over the long term it is also necessary to consider the category of time as changes made today do not affect only the current variables but they also have a significant impact on the future. This article aims to identify the most suitable model of choosing external funding sources that would describe the dynamics involved.

2. Theoretical foundations

The making of financial decisions represents a process of choosing the optimum variant of obtaining money and capital and their use with regard to the principal financial goals of business activities while taking into account a number of restricting conditions (Tetřevová, 2006). This process consists of weighing the most suitable variants, selecting the best variant, and controlling the implementation of accepted proposals (Paták, 2006).

The variants involved in this decision making process are individual external funding instruments: issue of shares, bank loans, financial leasing, issued bonds, obligations to suppliers, advances received, factoring and forfaiting. (These variants were identified by summarizing economic knowledge (Wohe, 2007), (Melicher, 2007), (McMenamin, 1999), (Valach, 2006), (Hrdý, 2008),(Synek, 2003) and then verified in the research conducted.)

Making a decision about the selection of an external funding instrument is a multi-criteria decision-making issue. The criteria involved are numerous and one of the tasks to be solved is the summarization of the most crucial criteria that will be assigned a decisive role.

According to expert knowledge (Kislingerová, 2004), (McMenamin, 1999), (Fabozzi, 2011), (Synek, 2003) the principal criteria are Weighted Average Cost of Capital (WACC).

Hrdý (2008) defines WACC as the individual kinds of capital that a company must pay for the acquisition of the respective kinds of capital.

However, WACC does not include only expenses but also hidden costs of equity as shown by the following formula (Brealey, 2000):

$$WACC = n_{ck} * (1-t) *CK/K + n_{vk} * VK/K \quad (1)$$

where

n_{ck} is the cost of loan capital,
t is a corporate tax rate,
CK is loan capital,
n_{VK} is the cost of equity,
VK is equity and
K is total capital.

Therefore, WACC denotes weighted average cost of both types of capital; i.e. the obvious cost of loan capital and the hidden costs of equity.

In general, the cost of equity can be determined either according to market approaches, or according to methods and models based on accounting data. The basic methods used to estimate the cost of equity are the following (Dluhošová, 2006):

- CAPM - Capital Asset Pricing Model,
- APM - Arbitrage Pricing Model,
- Dividend growth model, and
- Build-up models.

The CAPM model shows that expected risk changes in direct proportion to the beta coefficient which expresses the measure of a specific market risk by balancing it against the sensitivity of a share to changes in the market portfolio (Kislingová, 2004).

The APM model also belongs to the market valuation of assets but unlike CAPM it represents a multi-factor model. It considers both macroeconomic factors (e.g. gross domestic product or inflation) and microeconomic factors (return ratio, debt, liquidity, size) (Kislingerová, 2004).

The dividend model is used to value shares where the market price of a share is given by the current value of the future dividends from the share in individual years.

The build-up valuation of the cost of equity is based on a company's accounting data (Dluhošová, 2006):

$$N_{vk} = R_F + R_{business} + R_{finstab} + R_{LA}, \quad (2)$$

where:

R_F is a risk-free interest rate,
$R_{business}$ is a risk margin for business risk,
$R_{finstab}$ is a risk margin for risk ensuing from financial stability,
R_{LA} is a risk margin that characterizes a company's size.

There is even a methodology that describes a specific calculation method as the sum of a risk-free rate, a risk margin for equity, a risk margin for that characterizes profitability, a risk margin that characterizes liquidity and a risk margin that characterizes a company's ability to pay interest expenses on generated profit (Kislingerová, 2004).

3. Research

Synthesis of theoretical knowledge (Kislingerová, 2004), (McMenamin, 1999), (Fabozzi, 2011), (Synek, 2003) led to the specification of the following criteria: weighted average cost of capital (WACC), cost of capital, obligation to pay interest, possibility not to pay dividends, need for securing, rate of the acquisition of capital, possibility of early repayment and restriction upon the right to manage.

Furthermore, research was conducted to identify (or to verify) the proposed variant and criteria obtained through the synthesis of economic knowledge. Another objective of this research was to determine the weight of the individual criteria.

Research concerned a defined basic set of entities comprising joint-stock companies active in the field of civil engineering and having their seat in the Czech Republic. This form of business allows for the use of all existing types of external financing, including the issue of shares.

The building industry was chosen for the research of long-term funding because it utilizes a large number of fixed assets, its funding is based mainly on foreign sources (ČSÚ, 2011) and the sector currently faces a difficult period with the possible reduced availability of popular bank loans (Stuchlík, 2011). The building industry is characterized with the specific drawing of loans and the subsequent number of related failures (Stuchlík, 2011). The business organizations in this field are likely to need an alternative method of external funding.

Because data were investigated nationwide the form of written questionnaire was used. The course of investigation survey, definition of the basic set, preliminary choice and calculation of a representative sample were discussed in another article by this author (Honková, 2013).

The investigation survey verified the proposed variants and criteria. The decisive weights of the criteria were determined – see Table 1. It was confirmed that the most relevant criterion was the weighted average costs of capital (WACC) with a weight of 0.27 (%); meanwhile the right to manage criterion with a weight of 3 % was immaterial.

Variable	Average	Median	Modus	Frequency	Min	Max	Variance
WACC	0,271	0,25	0,00	13	0	0,90	0,234
Securing	0,211	0,20	0,10	12	0	0,50	0,143
Rate of the acquisition of capital	0,212	0,20	0,20	11	0	0,80	0,181
Possibility of early repayment	0,099	0,10	0,10	17	0	0,30	0,082
Right to manage	0,036	0,00	0,00	43	0	0,50	0,100
Obligation to pay interest	0,067	0,05	0,00	26	0	0,25	0,077
Possibility not to pay dividends	0,070	0,00	0,00	44	0	1,00	0,199
Cost of capital	0,030	0,00	0,00	48	0	0,50	0,09
Other criteria	0,000	0,00	0,00	56	0	0,00	0,00

Table 1. *Decisive weights of the criteria*

4. Additive method

The additive method was chosen as its transparency and simplicity make it one of the most frequently used methods.

With the additive method the values of the criteria must be homogenized to one dimension. Then, the partial utility of the individual criteria U_{ij} must be determined.

It is advised to combine both operations into one and directly transform the value of the criteria x_{ij} to partial utility U_{ij}.

The dependence of amount x and utility U is selected according to the sense of the criteria involved. The linear dependence of amount and utility is often applied: (Roudný, 2004)

$$U = \frac{x - D}{H - D} \tag{3}$$

where:

D is the lower limit of the amount with no utility U = 0,

H is the upper limit of the amount, where utility is maximum U = 1.

The resulting utility of the linear aggregation of the variant *i* is: (Roudný, 2009)

$$U_i - \sum_{i=1}^{m} U_{ij} * v_j \tag{4}$$

where:

m is the number of criteria k_j and

v_j refers to the weights of criteria.

5.1. Creation of a WACC model

Because our research confirmed the essential nature of the WACC criterion, it deserves close attention.

Unlike the cost of loan capital that can be determined quite easily, for instance in terms of interest on a provided loan or on a subscribed bond (Dluhošová, 2006), the determination of the cost of equity is rather complex. As stated above, there are globally recognized methods of determining the cost of equity on the basis of market approaches.

Initially, a WACC model (Honková, 2012) based on market approaches was compiled. This article deals with the combination of the CAPM and APM methods that are based on a so-called risk premium (Jindřichovská, 2001). The model adopted the macroeconomic factor of inflation, the microeconomic factors of indebtedness and total financial stability from the APM method. The model considered the quantity of bank

interest rate as a variable dependent on bank profitability, risk-free rate, a company's financial stability and inflation. Because the dependence of a company's financial stability on a bank interest rate is not known, this model was modified and as of now the bank interest rate is considered to be an independent variable determined as weighted average of bank rates and interest-bearing capital.

The final WACC model (Fig. 1) stems from a build-up method of determining the cost of equity; from the idea of adding up individual risks. However, the addition does not include risks derived from accounting data but market values as they better correspond to the current market situation; i.e. the risk-free rate and business risk in the sector.

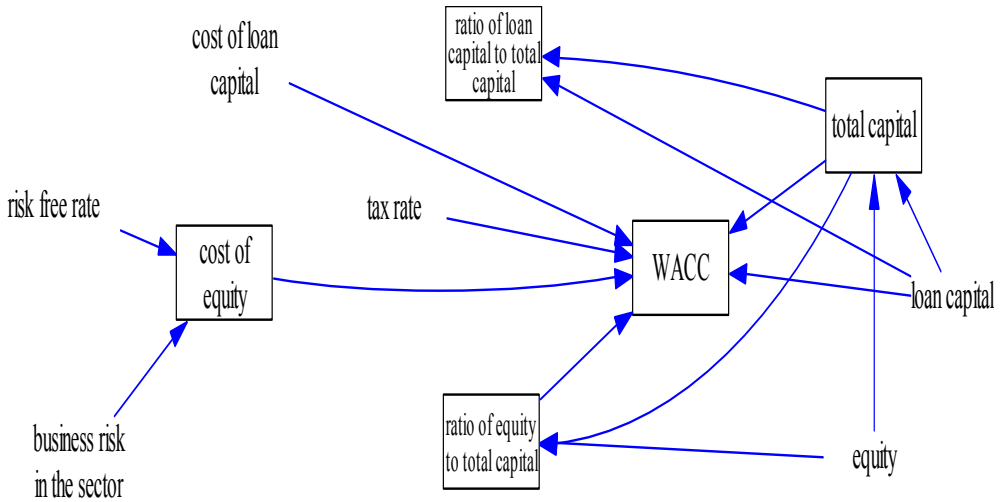
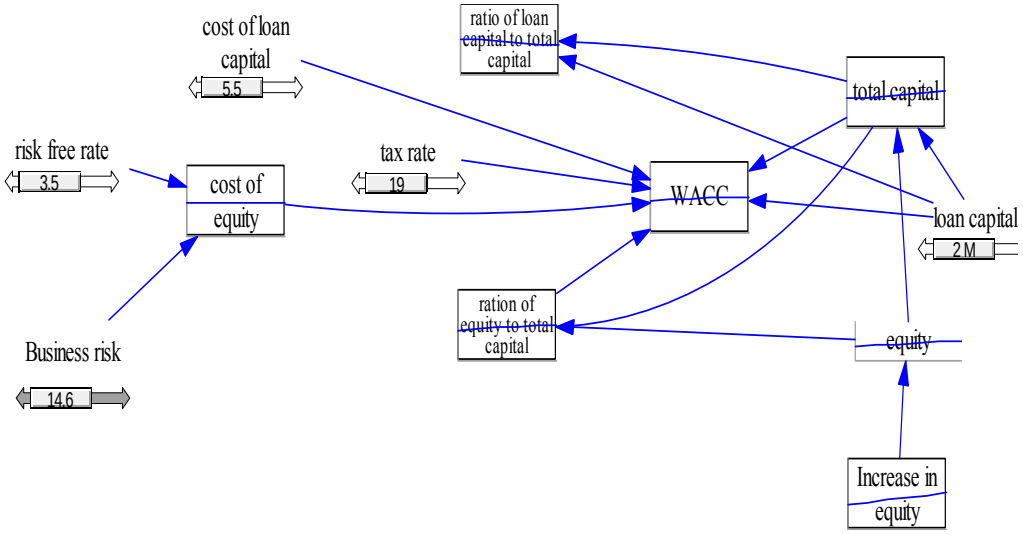
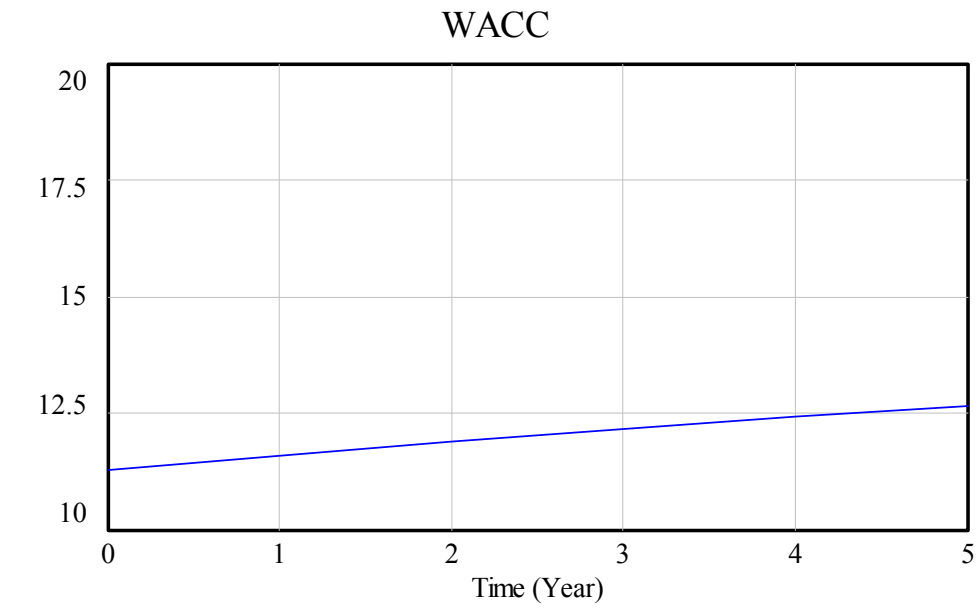


Fig. 1. *Model WACC*

The initial values of the independent variables are depicted in the arrows in the boxes in Fig. 2. These values can be modified arbitrarily in order to observe resulting WACC changes. As stated in the introduction, emphasis is put primarily on dynamics, which is why a change was introduced into the model, specifically an increase in equity by subscription of new shares from the initial value of 2 million by an annual increment of 200 000. As shown in Fig. 2 the increase in equity led to an increase in WACC.

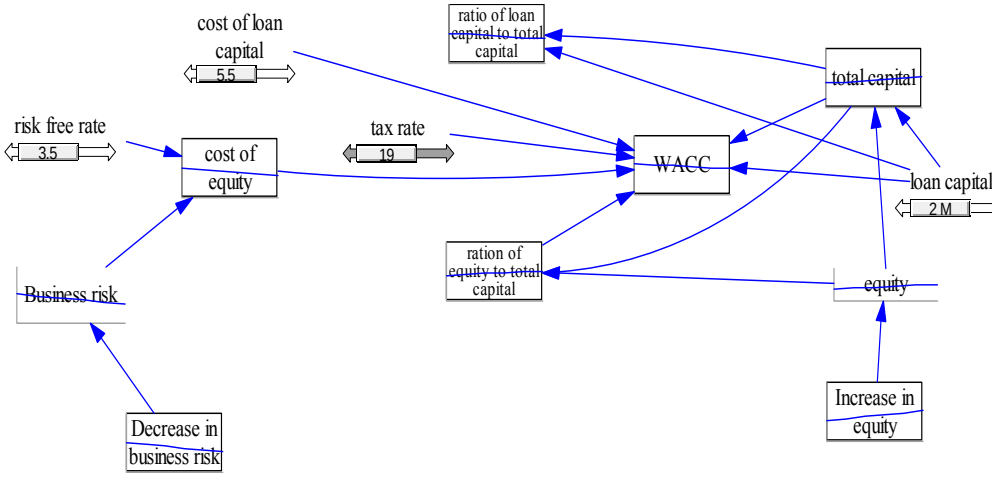


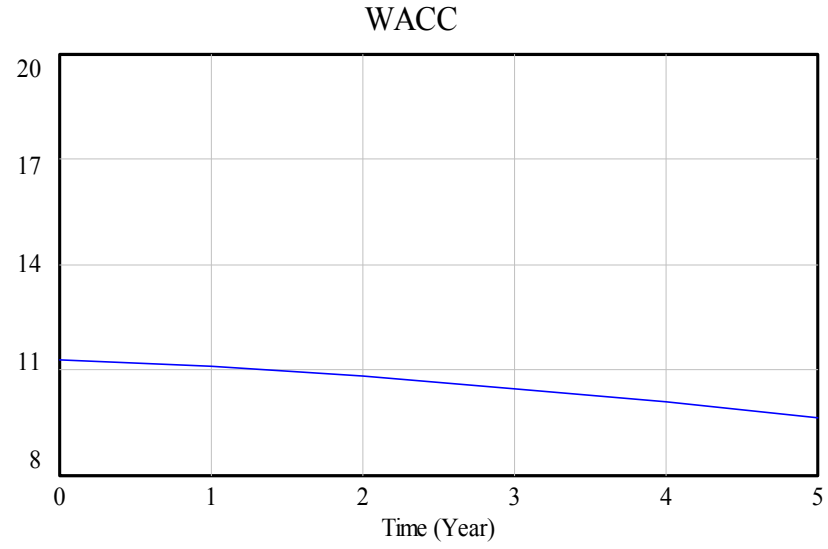


Time (Year)	0	1	2	3	4	5
WACC	11.2775	11.6024	11.8977	12.1674	12.4146	12.642

Fig. 2. *Running model WACC – Change in equity*

Another change was introduced into the WACC model (Fig. 2), leading to WACC reduction consisting of an annual gradual decrease in business risk of 1%. Fig. 3 illustrates the effect of the two contradictory changes on the final WACC. Over 5 years WACC fell by 1.63%.





Time (Year)	0	1	2	3	4	5
WACC	11.2775	11.0786	10.8068	10.4717	10.0813	9.642

Fig. 3. *Running model WACC – contradictory changes*

Now the initial WACC model has to be extended with further criteria in order to obtain a model that would solve the decision-making task regarding the selection of an external funding instrument, which was the objective of this paper. Because we deal with a multi-criteria decision-making system, it was necessary to use a decision-making method from the same area.

5. 2. Creation of a decision-making model about the use of an external funding instrument

The procedure of creating an extended model is shown in Table 2 which also provides instructions on how to enter individual criteria into the model.

All criteria are defined as minimizing; i.e. the smaller the entered values are, the more advantageous a certain criterion is.

Criteria	Minimum/ maximum limit	Unit	Weight	Value * weight
WACC	0 /100	%	0,27	
Securing	0/100	% of the new capital	0,21	
Acquisition of capital	0 – …	Days	0,21	
Possibility of early repayment	0 or 100	Yes/No	0,10	
Restriction upon the right to manage	0 – …	% Ratio of the new issue to equity	0,04	
Obligation to pay interest	0 or 100	Yes/No	0,07	
Possibility not to pay dividends	0 or 100	Yes/No	0,07	
Cost of capital	0 – …	% Ration of the cost to the new capital	0,03	
Total			1	

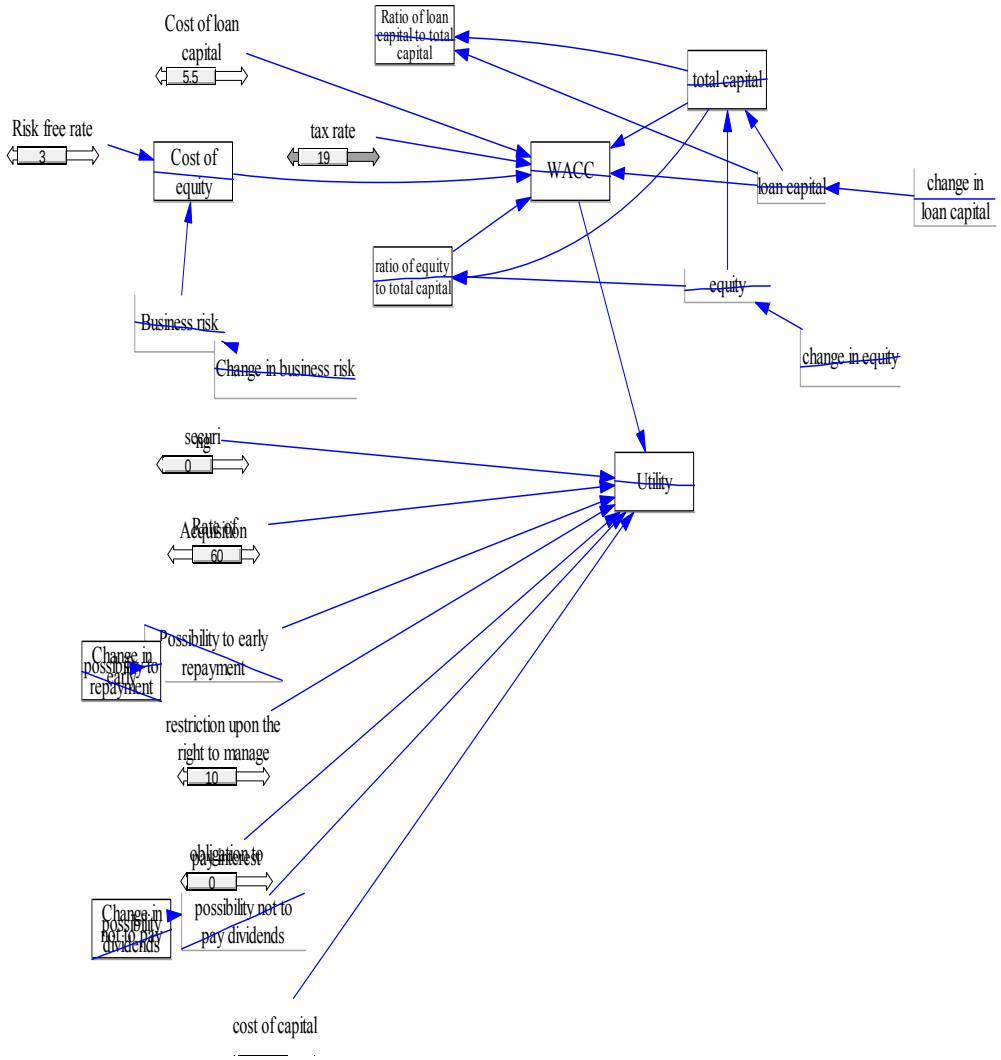
Table 2. *Entering of the values in the dynamic model of choosing an external funding instrument*

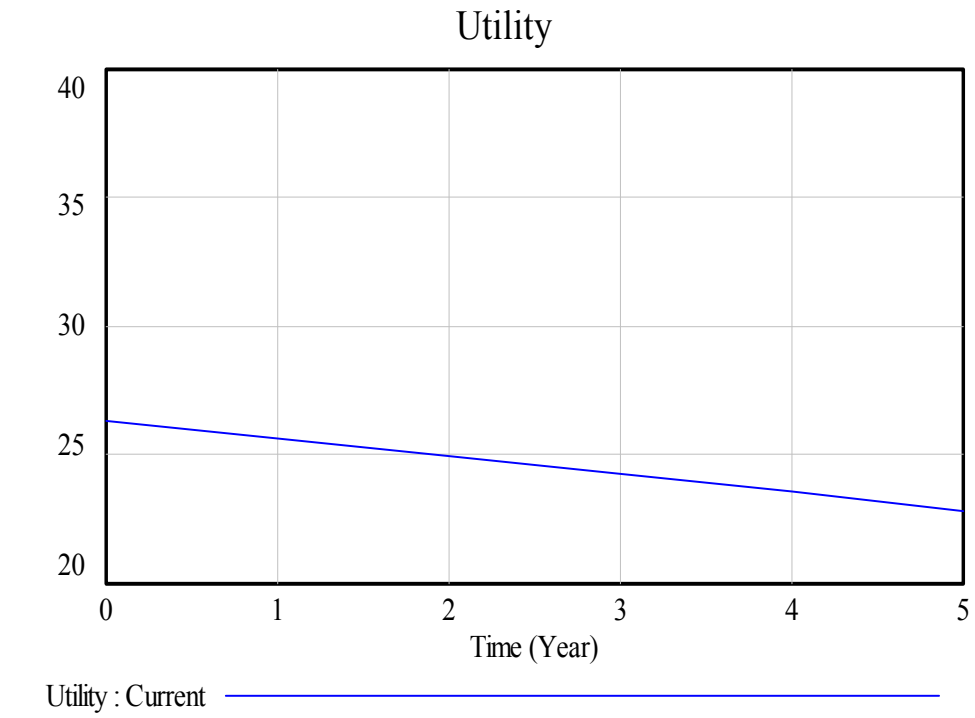
Figure 3 shows the modeling of WACC during a gradual increase in equity by subscription of new shares and a simultaneous decrease in business risk.

In order to solve the decision-making problem in concern it is necessary to perceive the utility of the external funding instrument of share subscription from the standpoint of more criteria than WACC alone.

Criteria according to Table 2 were entered into the model in Fig. 4: the criterion of securing that equals 0 as it is not required for the subscription of shares; the rate of the provision of capital by the subscription of shares equals 60 (days); the limitation of the right to manage at a ratio of 10 (%) to new capital; without the obligation to pay interest;

and the cost of the provision of capital at a ratio of 10 (%) to the capital provided. A change was simulated for the criteria of possible early repayment and of the possibility not to pay dividends.





Time (Year)	0	1	2	3	4	5
Utility	26.2774	25.6205	24.9442	24.2511	23.5432	22.822

Fig. 4. *Dynamic model of choosing an external funding instrument – share issue*

The result of the model is the values of utility as a minimizing criterion over the upcoming five years. These values are then compared with the values of the utility of other variants – external funding instruments. It is recommended to choose the variant with the least utility.

6. Discussion

The aim of this paper was to create a decision-making model for the use of an external funding instrument.

The results of the conducted research confirmed the proposed external financial instruments and decision-making criteria and indicated the weight of decision-making criteria.

In addition, weighted average cost of capital (WACC) were modeled, emphasizing the calculation of the cost of equity as this cost are not taken into account in many companies.

The WACC model was extended with remaining criteria and provided a decision-making model for the selection of external funding instruments in which various changes of values can be simulated by a decision-maker. The weight of the individual criteria is also only indicative and the decision-maker can thus employ different (own) preferences.

7. Conclusions

The created decision-making model facilitates the modeling of changes in time because it is crucial to know what future consequences lies in decisions made the contemporary turbulent world. Each variant features possible negative and positive changes of varying extent. The possibility to simulate these changes can illustrate an optimal variant to a decision-maker.

Decision-making regarding the selection of an external funding instrument is no longer a random process, often motivated by choosing the way of the least resistance. On the contrary, it is supported by rational considerations.

8. References

Brigham, Eugene and Joel Houston. 2004. *Fundamentals of Financial Management*. 10th ed. Ohio: Thomson South-Western. 831 s.

Brealey, Richard A. 2000. *Teorie a praxe firemních financí*. Vyd. 1. Praha: Computer Press, 1064 s.

Brennan, Michael, Julia Hein, and Ser-huang Poon. 2009. *Tranching and Rating. European Financial Management.* č. 15, s. 891-922.

Business finance: theory and practice.2003. 6. ed. London [u.a]: Pearson Education

Davydenko, Sergei A., and Ilya A. Strebulaev. 2007. „Strategic Actions and Credit Spreads". *Journal of Finance*. č. 62, s. 2633-2671.

Deangelo, Harry, Linde Deangelo, and Tony M. Whited. *Capital Structure Dynamics and Transitory Debt*. In: Ssrn.com/abstract=1262464 [online]. 2009 [cit. 2013-02-07]. Dostupné z: ssrn.com

Demarzo, Peter. 2005. „The Pooling and Tranching of Securities: A Model of Informed Intermediation". *Review of Financial Studies*. č. 18, s. 1-35.

Diamond, Douglas W. 2004. „Comitting to Commit: Short-Term Debt when Enforcement in Costly". *Journal of Finance*. 2004, č. 59, s. 1447-1479.

Dluhošová, Dana. 2006. *Finanční řízení a rozhodování podniku: analýza, investování, oceňování, riziko, flexibilita*. Vyd. 1. Praha: Ekopress, s. 104-114.

Duspiva, Pavel, and Josef Novotný. 2010. „Utilization of quantitative methods in the decision making process of a manager". *Scientific Papers of the University of Pardubice - Series D : Faculty of Economics and Administration*. 17, s. 63-69.

Faboz, Ehrhardt Michael C. and Eugene Brigham. 2011. *Corporate finance: a focused approach*. 4th ed. Mason, OH: South-Western Cengage Learning, c2011.

Fabozzi, Frank J., Edwin Neave, and Guofu Zhou. 2011. *Financial economics: a focused approach*. 4th ed. Hoboken, NJ: Wiley.

Hendl, Jan. 2012. *Přehled statistických metod: analýza a metaanalýza dat*. 4., rozšířené vyd. Praha: Portál.

Hindls, Richard. 2006. *Statistika pro ekonomy*. 7. vyd. Praha: Professional Publishing.

Honková, Irena. Průběh dotazníkového šetření podniků ve stavebním průmyslu. *Mezinárodní vědecká konference Hradecké ekonomické dny 2013*. Hradec Králové: Gaudeamus, 2013, s. 225-228.

Honková, Irena. „Dynamic model WACC". 2012. *Advances in Finance & Accounting: Proceedings of the 1st WSEAS International Conference on Finance, Accounting and Auditing*. Zlín: Tomas Bata University, s. 7.

Honková, Irena. 2011. „Návrh postupu při řešení rozhodovacích problémů Saatyho metodou." *Sborník příspěvků: IV.Mezinárodní vědecké konference doktorandů a mladých vědeckých pracovníků*. Karviná: Slezská univerzita v Opavě, s. 83-88.

Hrdý, Milan. 2008. *Strategické finanční řízení a investiční rozhodování: učebnice pro kombinované a distanční studium.* Fakulta ekonomická, Západočeská univerzita Plzeň. 1. vyd. Praha: Bilance, 199 s.

Jindřichovská, Irena. 2001. *Podnikové finance*. Vyd. 1. Praha: Management Press.

Keef, Stephen P., Mohammed S. Khaled, and Melvin Roush. 2012. A not resolving the debate on: the weighted average cost of capital in not quite right". *The Quarterly review of economics and finance: journal of the Midwest Economics Association* [online]. č. 10 [cit. 2013-02-14]. Dostupné z: https://studenti.upce.cz/knihovna.html

Kislingerová, Eva. 2004. *Manažerské finance*. 1. vyd. Praha: C. H. Beck.

Kopačková, Hana, Jaroslava Komárková, and Pavel Sedlák. 2007. „Knowledge Pre-Processing in Decision Making." *Computer science challenges: proceedings of 7th WSEAS International Conference on Applied Computer Science (ACS '07*), Venice Italy, November 21.23, 2007. Athens: World Scientific and Engineering Academy and Society, s. 134-139.

Kozel, Roman, Lenka Mynářová, and Hana Svobodová. 2011. *Moderní metody a techniky marketingového výzkumu*. 1. vyd. Praha: Grada. Expert (Grada).

Kožená, Marcela. 2007. Univerzita Pardubice. *Manažerská ekonomika: Teorie pro praxi*. Praha: C.H.Beck.

Lasher, William R. 2004. *Practical financial management*. 4th ed. Mason, Ohio: South-Western.

McMenamin, Jim. 1999. *Financial management: an introduction*. New York: Routledge.

Melicher, Ronald W., Egar, Norton, and Laura Town. 2007. *Finance*. Hoboken, NJ: Wiley.

Miller, A. Richard. 2009. „The weighted average cost of capital in not quite right". *SciVerse ScienceDirect Journals* [online]. č. 49, s. 128-138 [cit. 2013-02-14]. Dostupné z: https://studenti.upce.cz/knihovna.html

Ministerstvo Financí ČR. ARES: *Administrativní registr ekonomických subjektů* [online]. 2012 [cit. 2012-02-25]. Dostupné z: http://wwwinfo.mfcr.cz/ares

Morellec, Erwan, and Norman Schuerhoff. 2009. „Dynamic Investment and Financing under Asymmetric Information". *Swiss Finance Institute Working Paper*.

Paták, Milan R. *Podnikový finanční management*. 1. vyd. Praha: Idea servis, 2006, 234 s. ISBN 80-859-7052-X.

Petřík, Tomáš. 2009. *Ekonomické a finanční řízení firmy: manažerské účetnictví v praxi*. 2., výrazně rozš. a aktualiz. vyd. Praha: Grada.

Roudný, Radim, and Ondřej Víšek. 2009. *Základy manažerského rozhodování: distanční opora*. Vyd. 1. Pardubice: Univerzita Pardubice.

Statistická ročenka České republiky 2011: kód e-0001-11. In: Český statistický úřad [online]. 23.11.2011 [cit. 2012-02-19].Dostupné: http://www.czso.cz/csu/2011edicniplan.nsf/p/0001-11

Stuchlík, Jan. 2011. „Snadnou cestu k úvěru od banky nečekejte". *Nový profit*. roč. 22, č. 45, s. 19-22.

Synek, Miloslav. 2003. *Manažerská ekonomika*. 3. přeprac. a aktualiz. vyd. Praha: Grada.

Tetřevová, Liběna. 2006. *Financování projektů*. 1. vyd. Praha: Professional Publishing.

Valach, Josef. 2006. „Tendence současného vývoje dlouhohodobého finančního managementu". *Český finanční a účetní časopis*. roč. 1, č. 3, s. 22-32.

Watson, Denzil, and Antony Head. 2007. *Corporate finance: principles and practice*. 4th ed. New York: FT/Pearson Education.

Wöhe, Günter. 2007. *Úvod do podnikového hospodářství*. 2. přeprac. a dopl. vyd. Praha: C. H. Beck, Beckovy ekonomické učebnice.