New Meaningful Effects in Modern Capital Structure Theory

Peter Brusov[1,*], Tatiana Filatova[2], Natali Orekhova[3], Veniamin Kulik[4] and Irwin Weil[5]

[1]*Department of Data Analysis, Decision Making, and Financial Technology, Financial University under the Government of Russian Federation, Moscow, Russia*

[2]*Department of Corporate Finance and Corporate Governance, Financial University under the Government of Russian Federation, Moscow, Russia*

[3]*High Business School, Southern Federal University, Rostov–on–Don, Russia*

[4]*Department of Management, Financial University under the Government of Russian Federation, Moscow, Russia*

[5]*Northwestern University, Evanston, United States*

Abstract: Paper is devoted to describe the new meaningful effects in capital structure theory, discovered within modern theory of capital cost and capital structure, created by Brusov, Filatova and Orekhova (BFO theory). These qualitatively new effects are present in general version of BFO theory and absent in its perpetuity limit (Modigliani – Miller theory). BFO theory has changed some main existing principles of financial management. Discovered effects modify our understanding of financial management and dictate some unusual managerial decisions.

Keywords: Brusov- Filatova- Orekhova theory, Modigliani- Miller theory, trade off theory, ratings, new effects in corporate finance.

1. INTRODUCTION

One of the main and the most important problems in corporate finance is the problem of cost of capital, the impact of capital structure on its cost and capitalization of the companies and problem of an optimal capital structure of the companies (at which the company capitalization is maximal, and weighted average cost of capital *WACC* is minimal). The importance of these problems is connected to the fact, that one can doing nothing, just by change the ratio between debt and equity (by change the capital structure) increase the capitalization of the company, i.e. solve the main task of any company.

However, to date, even the question of the existence of an optimal capital structure of the companies still remains open. Numerous theories and models, including the first and the only one until recently quantitative theory by Nobel laureates Modigliani and Miller (MM), not only does not solve the problem, but also because of the large number of restrictions (such as, for example, theory of MM) have a weak relationship to the real economy. Herewith the qualitative theories and models, based on the empirical approaches, do not allow to carry out the necessary assessment.

This special issue is devoted to recent development of capital structure theory and its applications. Discussions will be made within both main theories: modern theory by Brusov, Filatova and Orekhova (BFO theory) and its perpetuity limit – classical Modigliani–Miller (MM) theory, which will be compared in details. From 2008 the BFO theory has replaced the famous theory of capital cost and capital structure by Nobel laureates Modigliani and Miller. The authors of BFO have moved from the assumption of Modigliani–Miller concerning the perpetuity (infinite time of life) of companies and further elaborated quantitative theory of valuation of core parameters of financial activities of companies of arbitrary age as well as of arbitrary time of life.

Results of modern BFO theory turn out to be quite different from ones of Modigliani–Miller theory. Brusov, Filatova and Orekhova show, that later, via its perpetuity, underestimates the assessment of weighted average cost of capital, the equity cost of the company and substantially overestimates the assessment of the capitalization of the company.

Such an incorrect assessment of key performance indicators of financial activities of companies has led to an underestimation of risks involved, and impossibility, or serious difficulties in adequate managerial decision–making, that was one of the implicit reasons of global financial crisis of 2008 year.

*Address correspondence to this author at the Department of Data Analysis, Decision Making, and Financial Technology, Financial University under the Government of Russian Federation, Russia; Tel: +79060675975;
Fax: +7(499) 277-2123; E-mail: pnb1983@yahoo.com

E-ISSN: 1929-7092/18

Within modern theory of capital cost and capital structure (BFO theory) a lot of qualitatively new results, described in this paper, have been obtained, among them:

– **Bankruptcy of the famous trade off theory has been proven**. BFO theory has destroyed some main existing principles of financial management: among them trade off theory, which was considered as keystone of formation of optimal capital structure of the company during many decades.

It would be a great pity if the optimal capital structure of the company does not exist in general, thus BFO authors have suggested the Mechanism of formation of the company optimal capital structure, different from suggested by trade off theory.

– The qualitatively new effect in corporate finance has been discovered by BFO authors: abnormal dependence of equity cost on leverage, which significantly alters the principles of the company's dividend policy.

– Existence of **"A golden age"** of the companies has been discovered. It was shown for the first time that valuation of WACC in the Modigliani – Miller theory is not minimal and valuation of the company capitalization is not maximal, as all financiers supposed up to now: at some age of the company its WACC value turns out to be lower, than in Modigliani – Miller theory (in perpetuity limit) and company capitalization *V* at some company age turns out to be greater, than company capitalization *V* in Modigliani – Miller theory.

– **The inflation in both Modigliani–Miller as well as in Brusov–Filatova–Orekhova theories** has been taken into account in explicit form, with the detected its non–trivial impact on the dependence of equity cost on leverage.

– **Study of the role of taxes and leverage** has been done, and obtained results allows to the Regulator set the tax on profits rate, and to businesses choose the optimal level of debt financing.

– **Investigation of the influence of tax on profit rate on effectiveness of investment projects** at different debt levels showed, that increase of tax on profit rate from one side leads to decrease of project NPV, but from other side it leads to decrease of sensitivity of NPV with respect to leverage level. At high leverage level L the influence of tax on profit rate on effectiveness of investment projects becomes significantly less.

– **The influence of growth of tax on profit rate** on the efficiency of the investment as well has led to two qualitatively new effects in investments:

1. the growth of tax on profit rate changes the nature of the NPV dependence on leverage L at some value t*: there is a transition from diminishing function NPV(L) at $t<t^*$, to growing function NPV(L) at $t>t^*$.

2. at high leverage levels the growth of tax on profit rate leads to the growth of the efficiency of the investments.

Discovered effects in investments can be applied in a real economic practice for optimizing of the management of investments.

New approach to rating methodology has been created. The first two papers of this Special issue is devoted to application of the perpetuity limit of BFO theory (MM theory) and general BFO theory to rating methodology: for the first time we incorporate the main parameters of ratings – rating "ratios" – directly into modern capital structure theory.

This allows use the powerful methods and "toolkit" of these theories in rating and creates practically the new basis of a rating methodology, that allows make more correct ratings.

A new approach to rating methodology has been suggested, key factors of which are: 1) The adequate use of discounting of financial flows virtually not used in existing rating methodologies, 2) The incorporation of rating parameters (financial "ratios") into the modern theory of capital structure (BFO theory). This on the one hand allows use the powerful tools of this theory in the rating, and on the other hand it ensures the correct discount rates when discounting of financial flows. We discuss also the interplay between rating ratios and leverage level which can be quite important in rating. All these create a new base for rating methodologies.

Established BFO theory allows to conduct a valid assessment of the core parameters of financial activities of companies, such as weighted average cost of capital and equity capital cost of the company, its capitalization. It allows to a management of company make adequate decisions, that improves the effectiveness of the company management. More generally, the introduction of the new system of evaluation of the parameters of financial activities of companies into the systems of financial reporting

(IFRS, GAAP etc.) would lead to lower risk of global financial crisis.

Corporate management in the modern world is the management of financial flows. The proposed Brusov–Filatova–Orekhova theory allows correctly identify a discount rates – basic parameters for discounting of financial flows to arbitrary time moment, compare financial flows with a view to adoption of literate managerial decisions. The discount rate is a key link of the existing financial system, by pulling on the which modern finance can be adequately build, and BFO theory can assist in this.

In this paper we discuss a numerous new meaningful effects in modern capital structure theory.

2. COMPARISION OF MODIGLIANI – MILLER (MM) AND BRUSOV–FILATOVA–OREKHOVA (BFO) RESULTS

2.1. The Traditional Approach

The traditional (empirical) approach told to businessmen, that weighted average cost of capital, WACC, and the associated company capitalization, $V = CF/WACC$ depend on the capital structure, the level of leverage. Debt cost always turns out to be lower, than equity cost, because first one has lower risk, because in the event of bankruptcy creditor claims are met prior to shareholders claims.

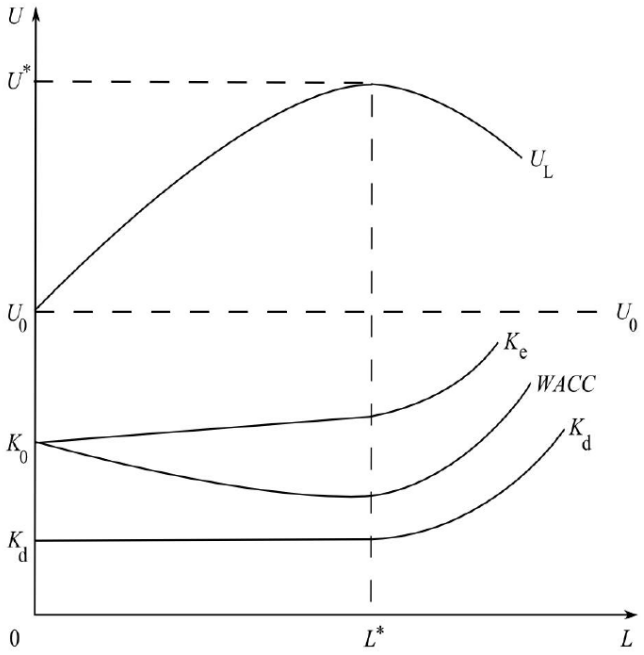

Figure 1: Dependence of company capitalization, U_L, equity cost, k_e, debt cost, k_d, weighted average cost of capital, *WACC*, in traditional (empirical) approach.

As a result an increase in the proportion of lower–cost debt capital in the overall capital structure up to the limit which does not cause violation of financial sustainability and growth in risk of bankruptcy, leads to lower weighted average cost of capital, WACC.

The required by investors profitability (the equity cost) is growing, however, its growth has not led to compensation benefits from use of more low–cost debt capital. Therefore, the traditional approach welcomes the increased leverage $L = D/S$, and the associated increased of company capitalization. The traditional (empirical) approach has existed up to appearance of the first quantitative theory by Modigliani and Miller in 1958 (Modigliani *et al.* 1958).

2.2. Modigliani–Miller Theory

Modigliani–Miller theory with taxes is based on following three formulae for capitalization *V*, *WACC* and equity cost k_e.

$$V = V_0 + Dt,$$

$$WACC = k_0(1 - w_d T),$$

$$k_e = k_0 + L(1-T)(k_0 - k_d).$$

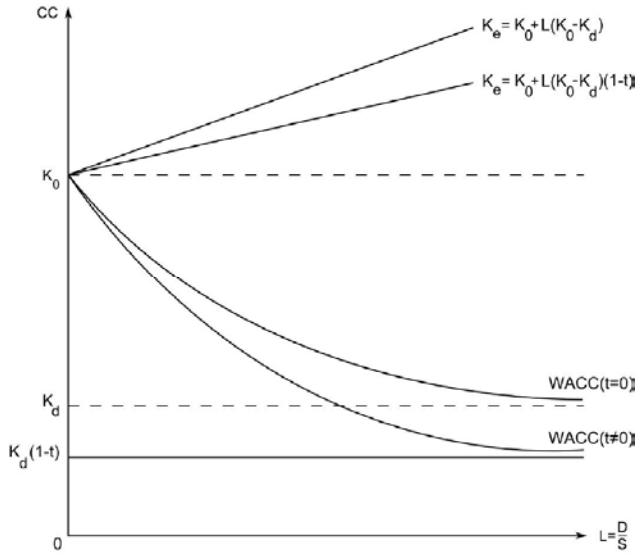

Figure 2: Dependence of equity capital cost, debt cost and *WACC* on leverage in Modigliani – Miller theory without taxes ($t = 0$) and with taxes ($t \neq 0$).

One of the most important assumptions of the Modigliani – Miller theory is that all financial flows are perpetuity.

This limitation was lift out by Brusov–Filatova–Orekhova in 2008, who have created BFO theory –

modern theory of capital cost and capital structure for companies of arbitrary age (BFO–I) and for companies of arbitrary life time (BFO–II) (Brusov *et al.* 2015).

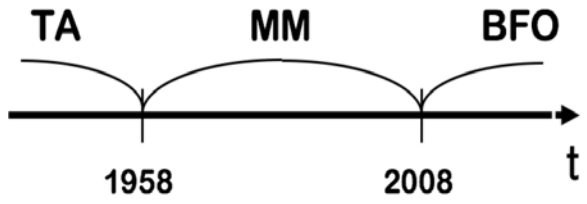

Figure 3: Historical development of capital structure theory (here TA – traditional (empirical) approach, MM – Modigliani – Miller approach, BFO – Brusov–Filatova–Orekhova theory).

Note, that before 2008 only two results for capital structure of company were available:

Modigliani – Miller for perpetuity company and Myers for one – year company (see Figure **4**).

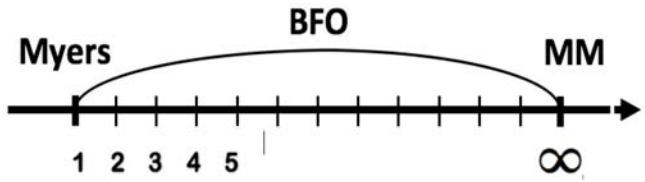

Figure 4: MM theory describes perpetuity limit, Myers paper describes one–year company while BFO theory fills the whole numeric axis (from n=1 up to perpetuity limit $n=\infty$).

BFO theory has filled out whole interval between t=1 and t=∞. One got the possibility to calculate capitalization *V*, *WACC* and equity cost k_e for companies of arbitrary age and for companies of arbitrary life time. BFO theory has lead to a lot of new meaningful effects in modern capital structure theory, discussed in this paper.

BFO theory is based on famous formula

$$\frac{1-\left(1+WACC\right)^{-n}}{WACC}=\frac{1-\left(1+k_0\right)^{-n}}{k_0\left[1-\omega_d T\left(1-\left(1+k_d\right)^{-n}\right)\right]}. \qquad (1)$$

Here, *S* – the value of own (equity) capital of the company, $w_d=\frac{D}{D+S}$ – the share of debt capital; $k_e, w_e=\frac{S}{D+S}$ – the cost and the share of the equity of the company,

$L=D/S$ – financial leverage.

3. COMPARISION OF MODIGLIANI – MILLER RESULTS (PERPETUITY COMPANY) WITH MYERS RESULTS (ONE YEAR COMPANY) AND BRUSOV–FILATOVA–OREKHOVA ONES (COMPANY OF ARBITRARY AGE)

We could compare the Modigliani – Miller results (perpetuity company) with Myers results (one year company) and Brusov–Filatova–Orekhova ones (company with arbitrary age) under valuation of WACC and equity cost.

From Tables **1,2** and Figure **5** it is obviously that WACC has a maximum for one year company and decreases with the age (life–time) of the company, reaching the minimum in the Modigliani–Miller perpetuity case. (Note, however, that this not always be so via the effect of "golden age" of the company (see below)).

Results of modern BFO theory turn out to be quite different from ones of Modigliani–Miller theory. They

Table 1: Dependence of WACC and k_e on Leverage Level for *n*=1, and $n=\infty$

L	Ko	Kd	t	n	Wd	WACC	BFO	Ke	WACC MM	MM Ke
0	0,2	0,1	0,2	1	0,00	20,00%	0,000	0,2000	20,00%	0,2000
1	0,2	0,1	0,2	1	0,50	18,91%	0,000	0,2982	18,00%	0,2800
2	0,2	0,1	0,2	1	0,67	18,55%	0,000	0,3964	17,33%	0,3600
3	0,2	0,1	0,2	1	0,75	18,36%	0,000	0,4945	17,00%	0,4400
4	0,2	0,1	0,2	1	0,80	18,25%	0,000	0,5927	16,80%	0,5200
5	0,2	0,1	0,2	1	0,83	18,18%	0,000	0,6909	16,67%	0,6000
6	0,2	0,1	0,2	1	0,86	18,13%	0,000	0,7891	16,57%	0,6800
7	0,2	0,1	0,2	1	0,88	18,09%	0,000	0,8873	16,50%	0,7600
8	0,2	0,1	0,2	1	0,89	18,06%	0,000	0,9855	16,44%	0,8400
9	0,2	0,1	0,2	1	0,90	18,04%	0,000	1,0836	16,40%	0,9200
10	0,2	0,1	0,2	1	0,91	18,02%	0,000	1,1818	16,36%	1,0000

Table 2: Dependence of WACC and k_e on Leverage Level for n=3, and $n = \infty$

L	Ko	Kd	t	n	Wd	WACC	BFO	Ke	WACC MM	MM Ke
0	0,2	0,1	0,2	3	0,00	20,00%	0,000	0,2000	20,00%	0,2000
1	0,2	0,1	0,2	3	0,50	18,41%	0,000	0,2881	18,00%	0,2800
2	0,2	0,1	0,2	3	0,67	17,87%	0,000	0,3762	17,33%	0,3600
3	0,2	0,1	0,2	3	0,75	17,61%	0,000	0,4642	17,00%	0,4400
4	0,2	0,1	0,2	3	0,80	17,44%	0,000	0,5522	16,80%	0,5200
5	0,2	0,1	0,2	3	0,83	17,34%	0,000	0,6402	16,67%	0,6000
6	0,2	0,1	0,2	3	0,86	17,26%	0,000	0,7283	16,57%	0,6800
7	0,2	0,1	0,2	3	0,88	17,20%	0,000	0,8163	16,50%	0,7600
8	0,2	0,1	0,2	3	0,89	17,16%	0,000	0,9043	16,44%	0,8400
9	0,2	0,1	0,2	3	0,90	17,12%	0,000	0,9923	16,40%	0,9200
10	0,2	0,1	0,2	3	0,91	17,09%	0,000	1,0803	16,36%	1,0000

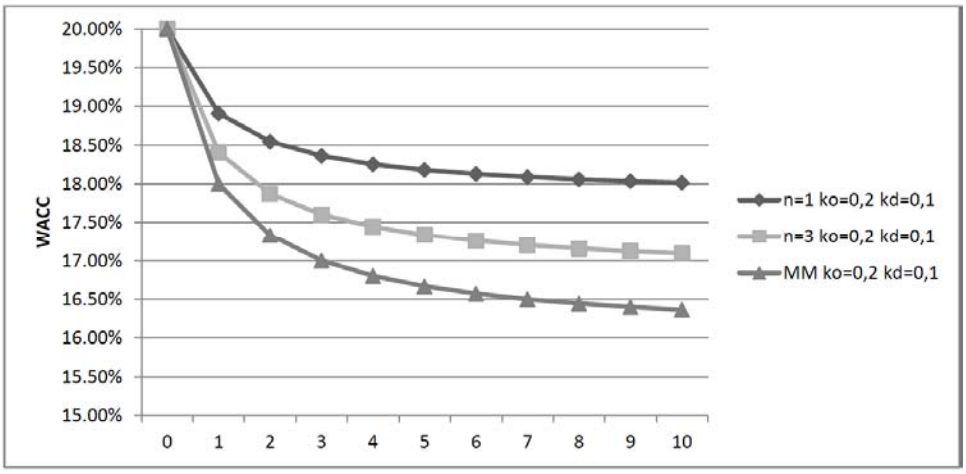

Figure 5: Dependence of WACC on leverage level for n=1, n=3 and $n = \infty$.

show, that later, via its perpetuity, underestimates the assessment of weighted average cost of capital, the equity cost of the company and substantially overestimates the assessment of the capitalization of the company.

Such an incorrect assessment of key performance indicators of financial activities of companies has led to an underestimation of risks involved, and impossibility, or serious difficulties in adequate managerial decision–making, that was one of the implicit reasons of global financial crisis of 2008 year.

BFO theory allows make an correct assessment of key parameters of financial activities of companies of arbitrary age (arbitrary life time) that leads accordingly to adequate managerial decision–making.

4. BANKRUPTCY OF THE FAMOUS TRADE OFF THEORY

Within modern theory of capital structure and capital cost by Brusov–Filatova–Orekhova (Brusov *et al.* 2011a,b,c,d,e; 2012 a,b; 2013 a,b,c; 2014 a,b; Filatova *et al.* 2008) the analyses of wide known trade off theory has been made. It is shown that suggestion of risky debt financing (and growing credit rate near the bankruptcy) in opposite to waiting result does not lead to growing of weighted average cost of capital, WACC, which still decreases with leverage. This means the absence of minimum in the dependence of WACC on leverage as well as the absence of maximum in the dependence of company capitalization on leverage. Thus, it means that the optimal capital structure is absent in famous trade off theory. The explanation to this fact has been done.

Table 3: Dependence of *WACC* on *L*

n	L	0	1	2	3	4	5	6	7	8	9	10
3	kd	0.07	0.07	0.07	0.08	0.11	0.16	0.23	0.32	0.43	0.56	0.71
k0	A	1.9813	2.0184	2.0311	2.0445	2.0703	2.1075	2.1520	2.1988	2.2438	2.2842	2.3186
0.24	WACC	0.2401	0.2279	0.2238	0.2195	0.2111	0.1997	0.1864	0.1730	0.1605	0.1496	0.1406

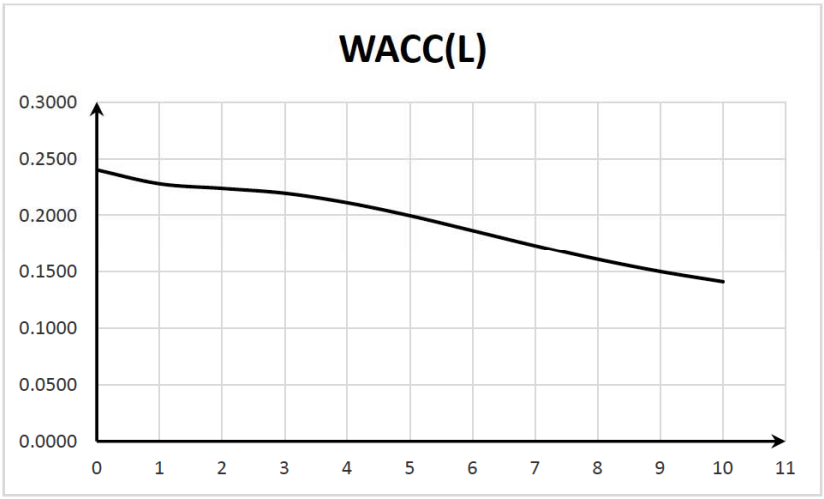

Figure 6: Dependence of WACC on L.

Table 4: Dependence of Equity Cost k_e on L

n	L	0	1	2	3	4	5	6	7	8	9	10
3	kd	0.07	0.07	0.07	0.08	0.11	0.16	0.23	0.32	0.43	0.56	0.71
k0	A	1.9813	2.0184	2.0311	2.0445	2.0703	2.1075	2.1520	2.1988	2.2438	2.2842	2.3186
0.24	Ke	0.2401	0.3997	0.5594	0.6861	0.7036	0.5581	0.2011	–0.4081	–1.3075	–2.5356	–4.133

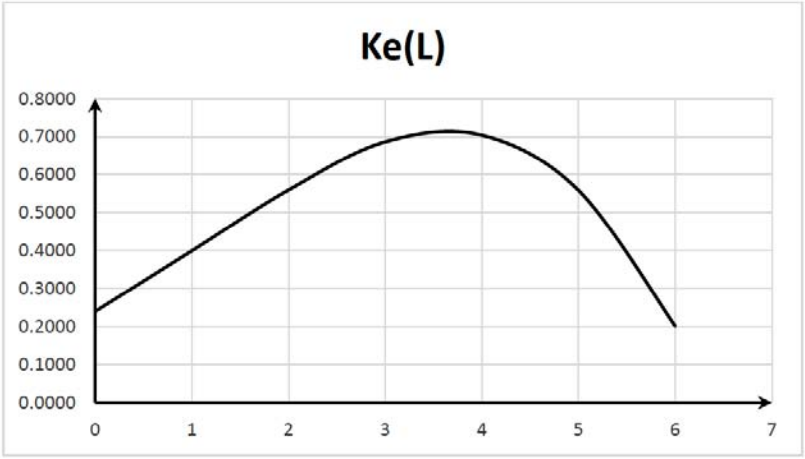

Figure 7: Dependence of equity cost k_e on L.

In modified Modigliani–Miller theory we have proved the following theorem:

In modified Modigliani–Miller theory (allowing riskiness debt capital) under arbitrary change of debt cost with leverage (growing, as well as decrease) weighted average cost of capital, WACC always fall down with leverage. This means the absence of the company optimal capital structure and proves insolvency well–known classical trade off in its original formulation.

We consider linear and quadratic growth of debt cost k_d with leverage, starting from some value (with different coefficients), different values of k_0 and different terms of life of the companies. Let us find WACC values.

1. $n = 3; t = 20\%; L = 0,1,2,...10$

$$k_0 = 24\%; \overline{k}_d = \begin{Bmatrix} 0,07; at\ L \le 2 \\ 0,07 + 0,01(L-2)^2; at\ L > 2 \end{Bmatrix} \quad (2)$$

Let us see, how the growth of debt cost k_d with leverage affects the equity cost k_e dependence on leverage. We will consider the same cases as above for the calculations of dependences WACC(L).

1. $n = 3; t = 20\%; L = 0,1,2,...10$

$$k_0 = 24\%; \overline{k}_d = \begin{Bmatrix} 0.07; at\ L \le 2 \\ 0.07 + 0.01(L-2)^2; at\ L > 2 \end{Bmatrix} \quad (3)$$

The analysis of well–known trade off theory, conducting with the help of modern theory of capital structure and capital cost by Brusov–Filatova–Orekhova, has shown that that suggestion of risky debt financing (and growing credit rate near the bankruptcy) in opposite to waiting result does not lead to growing of WACC, which still decreases with leverage. This means the absence of minimum in the dependence of WACC on leverage as well as the absence of maximum in the dependence of capitalization *V* on leverage. Thus, it seems that the optimal capital structure is absent in famous trade off theory. The explanation to this fact has been done within the same Brusov–Filatova–Orekhova theory by study the dependence of the equity cost k_e with leverage. It turned out that the growth of debt cost k_d with leverage lead to decrease of equity cost k_e with leverage, starting from some leverage level, which is higher than starting point of debt cost growth. This paradox conclusion gives the explanation of the absence of the optimal capital structure in the famous trade off theory. This means, that competition of benefits from using of debt financing and of financial distress cost (or a bankruptcy cost) are NOT balanced and hopes, that trade off theory gives us the optimal capital structure, unfortunately, do not realized.

The absence of the optimal capital structure in the trade off theory questioned the existence of an optimal capital structure of the company (but as authors have shown, the optimal capital structure for the investment still exists (Brusov *et al*. 2011b, 2011c)). In the search for the "golden fleece" one needs to switch to study of other mechanisms for formation of the capital structure of the company, different from ones considering in trade off theory.

5. THE QUALITATIVELY NEW EFFECT IN CORPORATE FINANCE

Qualitatively new effect in corporative finance is discovered: decreasing of cost of equity k_e with leverage L. This effect, which is absent in perpetuity Modigliani–Miller limit, takes place under account of finite lifetime of the company at tax on profit rate, which exceeds some value T*.

At some ratios between cost of debt and cost of equity the discovered effect takes place at tax on profit rate, existing in western countries and Russia. This provides the practical meaning of discussed effect. Its accounting is important at modification of tax low and can change the dividend policy of the company.

5.1. Perpetuity Modigliani–Miller Limit

One see from Figure **8,** that position limit of dependence of cost of equity on leverage *L* is horizontal line 11 at *T*=1. Below we'll see that in BFO theory the abnormal effect takes place (see Figure **10**) and dependence of cost of equity on leverage *L* line could have a negative slope.

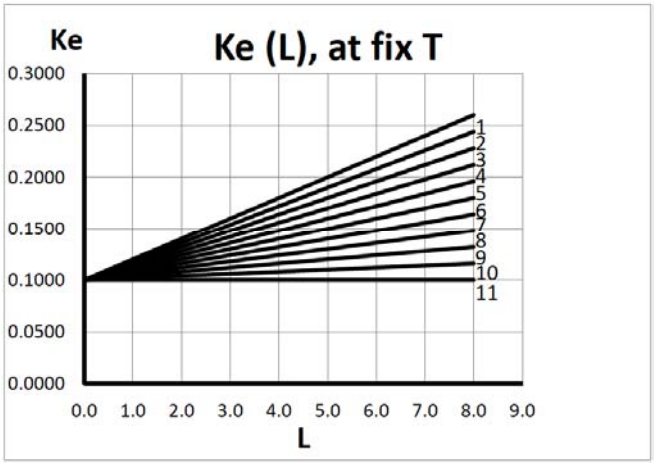

Figure 8: Dependence of cost of equity on leverage *L* at different tax on profit rates *T* for the case $k_0 = 10\%;\ k_d = 8\%$ (1 – $T = 0$; 2 – $T = 0.1$; 3 – $T = 0.2$; 4 – $T = 0.3$; 5 – $T = 0.4$; 6 – $T = 0.5$; 7 – $T = 0.6$; 8 – $T = 0.7$; 9 – 10 – $T = 0.9$; 11 – $T = 1$).

5.2. BFO Theory

From Figure **10** it is seen, that dependence of cost of equity k_e on leverage level *L* with a good accuracy is linear. The tilt angle decreases with tax on profit rate like the perpetuity case.

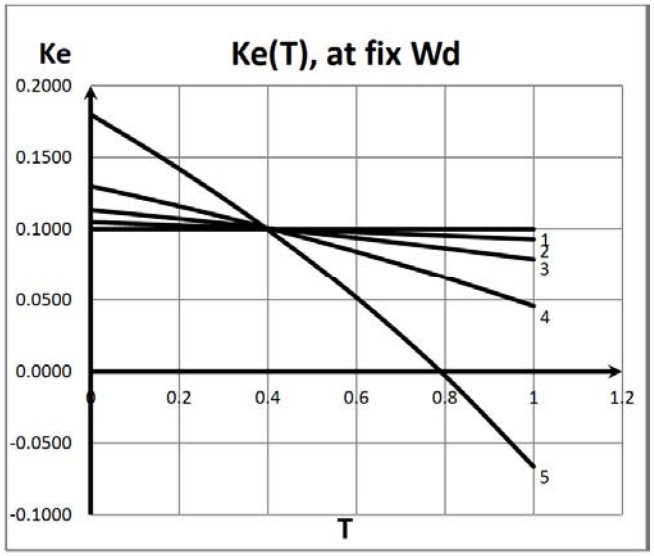

Figure 9: Dependence of cost of equity k_e on tax on profit rate *T* at different fix leverage level *L* ($n=10, k_0=10\%, k_d=8\%$) (1 – $w_d=0$; 2 – $w_d=0.2$; 3 – $w_d=0.4$; 4 – $w_d=0.6$; 5 – $w_d=0.8$).

However for the finite lifetime of companies along with the behavior $k_e(L)$, similar to the perpetuity behavior of the Modigliani–Miller case (Figure **8**), for some sets of parameters n, k_0, k_d there is a otherwise behavior $k_e(L)$.

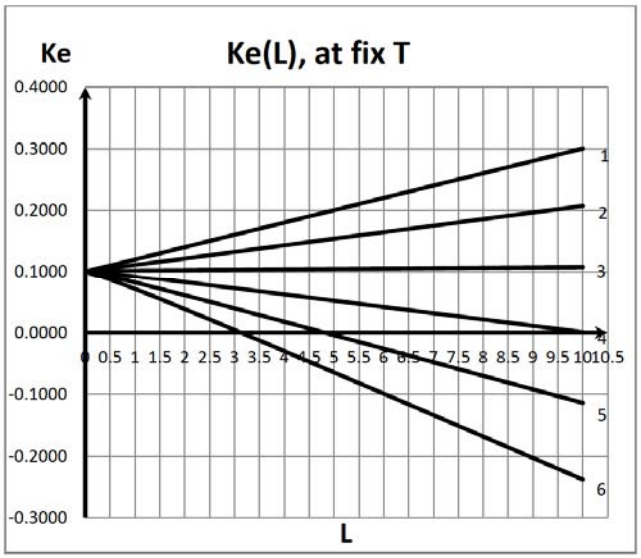

Figure 10: Dependence of cost of equity k_e on leverage level *L* at different tax on profit rate *T* ($n=5, k_0=10\%, k_d=8\%$) (1 – $T=0$; 2 – $T=0.2$; 3 – $T=0.4$; 4 – $T=0.6$; 5 – $T=0.8$; 6 – $T=1$).

From the Figure **10** it is seen that starting from some values of tax on profit rate T^* (in this case from $T^*=40\%$, although at other sets of parameters n, k_0, k_d critical values of tax on profit rate T^* could be lower) there is not the rise in the cost of equity of the company with leverage, but descending. Once again, the presence or the absence of such an effect depends on a set of parameters k_0, k_d, n.

This effect has been observed above in the dependence of cost of equity k_e on tax on profit rate *T* at fix leverage level, but it is more clearly visible, depending on value of cost of equity of the company on the leverage for various values of tax on profit rate *T*.

Note that this is a new effect, which may take place only for the finite lifetime company and which is not observed in perpetuity Modigliani–Miller limit.

It is easy to recieve from the Modigliani–Miller formula for *WACC*

$$WACC = k_e w_e + k_d w_d (1-T)$$

formula for k_e

$$k_e = k_0 + L(1-T)(k_0 - k_d),$$

from which one can see that at $T=1\ (100\%)$ cost of equity k_e does not change with leverage: $k_e = k_0$, i.e there is no decreasing of k_e with leverage at any tax on profit rate *T*.

CONCLUSIONS

Qualitatively new effect in corporative finance is discovered: decreasing of cost of equity k_e with leverage *L*. This effect, which is absent in perpetuity Modigliani–Miller limit, takes place under account of finite lifetime of the company at tax on profit rate, which exceeds some value T* (Brusov *et al.* 2011a,b,c,d,e; 2012 a,b; 2013 a,b,c; 2014 a,b; Filatova *et al.* 2008).

At some ratios between debt cost and equity cost the discovered effect takes place at tax on profit rate, existing in western countries and Russia. This provides the practical meaning of discussed effect. Its accounting is important at modification of tax low and can change the dividend policy of the company.

The complete and detailed investigation of discussed effect, discovered within Brusov – Filatova – Orekhova (BFO) theory, has been done (Brusov *et al.* 2011a,b,c,d,e; 2012 a,b; 2013 a,b,c; 2014 a,b; Filatova *et al.* 2008). It has been shown, that the absence of the effect at some particular set of parameters is connected to the fact, that in these cases T* exceeds 100% (tax on profit rate is situated in a ”non– financial” region).

Table 5: k_d, k_e **and Weighted Average Cost of Capital,** ***WACC*****, for Companies with Lifetimes** ***n*****=1; 3;5;10**

L	0	0.5	1	1.1	1.3	1.6	2	3	4
Kd	0.12	0.12	0.12	0.1188	0.1161	0.1107	0.1	0.04	–0.14
WACC (n=1)	0.220	0.211	0.207	0.206	0.205	0.206	0.206	0.214	0.252
Ke (n=1)	0.220	0.257	0.294	0.302	0.320	0.358	0.417	0.736	1.819
WACC (n=3)	0.219	0.208	0.201	0.201	0.199	0.199	0.198	0.209	0.279
Ke (n=3)	0.219	0.252	0.281	0.291	0.307	0.340	0.395	0.716	1.955
WACC (n=5)	0.220	0.206	0.200	0.199	0.197	0.197	0.196	0.207	0.301
Ke (n=5)	0.220	0.250	0.279	0.287	0.303	0.335	0.388	0.710	2.067
WACC (n=10)	0.220	0.206	0.199	0.198	0.196	0.196	0.194	0.205	0.383
Ke(n=10)	0.220	0.249	0.277	0.285	0.301	0.332	0.383	0.699	2.474

In future, the papers and monographs will be devoted to discussion of discovered abnormal effect, but it is already now clear, that we will have to abandon of some established views in corporative finance.

6. MECHANISM OF FORMATION OF THE COMPANY OPTIMAL CAPITAL STRUCTURE

Under condition of proved by us insolvency of well–known classical trade off theory question of finding of new mechanisms of formation of the company optimal capital structure, different from one, suggested by trade off theory, becomes very important. One of the real such mechanisms has been developed by us in this Chapter. It is based on the decrease of debt cost with leverage, which is determined by growth of debt volume. This mechanism is absent in perpetuity Modigliani–Miller theory, even in modified version, developed by us, and exists within more general modern theory of capital cost and capital structure by Brusov – Filatova – Orekhova (BFO theory).

Suggested mechanism of formation of the company optimal capital structure is based on the decrease of debt cost, which (in some range of leverage levels) is determined by growing of the debt volume.

We will study below the dependence of equity cost k_e and weighted average cost of capital, WACC, on leverage level *L* in case of debt cost k_d exponential decrease.

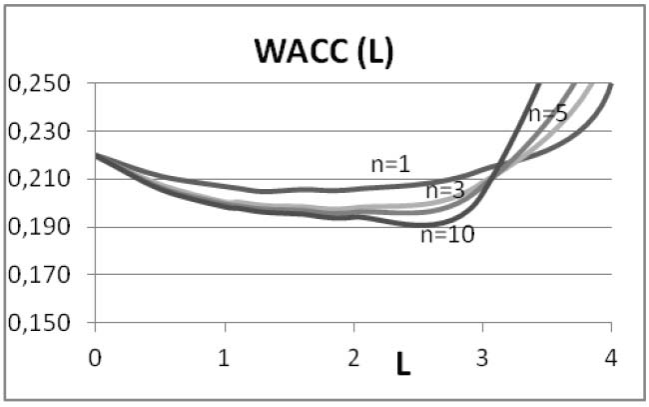

Figure 12: Dependence of weighted average cost of capital, WACC on leverage level *L* in case of exponential decrease of debt cost at $\alpha = 0.01$.

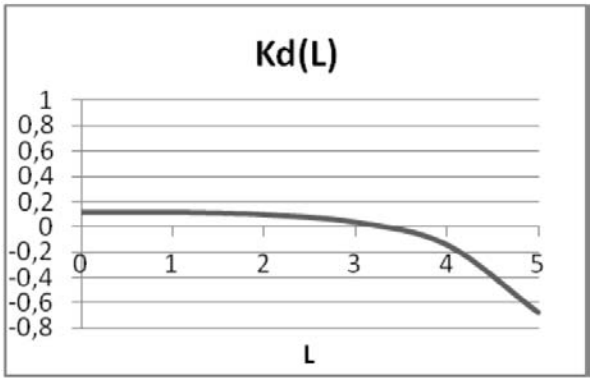

Figure 11: Dependence of debt cost k_d on leverage level *L* in case of its exponential decrease at $\alpha = 0.01$.

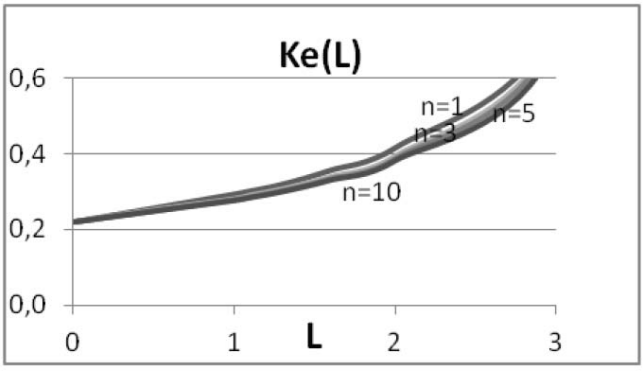

Figure 13: Dependence of equity cost k_e on leverage level *L* in case of its exponential decrease at $\alpha = 0.01$.

Table 6: k_d, k_e **and Weighted Average Cost of Capital, WACC, for Companies with Lifetimes n=1; 3;5;10**

L	0	0.5	1	1.1	1.3	1.6	2	3	4
Kd	0.12	0.12	0.12	0.1188	0.1161	0.1107	0.1	0.04	–0.14
WACC (n=1)	0.220	0.211	0.207	0.206	0.205	0.206	0.206	0.214	0.252
Ke (n=1)	0.220	0.257	0.294	0.302	0.320	0.358	0.417	0.736	1.819
WACC (n=3)	0.219	0.208	0.201	0.201	0.199	0.199	0.198	0.209	0.279
Ke (n=3)	0.219	0.252	0.281	0.291	0.307	0.340	0.395	0.716	1.955
WACC (n=5)	0.220	0.206	0.200	0.199	0.197	0.197	0.196	0.207	0.301
Ke (n=5)	0.220	0.250	0.279	0.287	0.303	0.335	0.388	0.710	2.067
WACC (n=10)	0.220	0.206	0.199	0.198	0.196	0.196	0.194	0.205	0.383
Ke(n=10)	0.220	0.249	0.277	0.285	0.301	0.332	0.383	0.699	2.474

The case $\alpha = 0{,}01$. Let us consider first the case $\alpha = 0{,}01$.

The case $\alpha = 0{,}01$. Let us consider first the case $\alpha = 0{,}01$.

We will study below the dependence of debt cost k_d, equity cost k_e and weighted average cost of capital, WACC, on leverage level *L* in case of k_d exponential decrease.

7. "A GOLDEN AGE" OF THE COMPANY

Authors of BFO theory have investigated the dependence of attracting capital cost on the time of life of company n at various leverage levels, at various values of capital costs with the aim of define of minimum cost of attracting capital. All calculations have been done within modern theory of capital cost and capital structure by Brusov–Filatova–Orekhova (Brusov *et al.* 2015; Brusov *et al.* 2011a,b,c,d,e; 2012 a,b; 2013 a,b,c; 2014 a,b; Filatova *et al.* 2008).

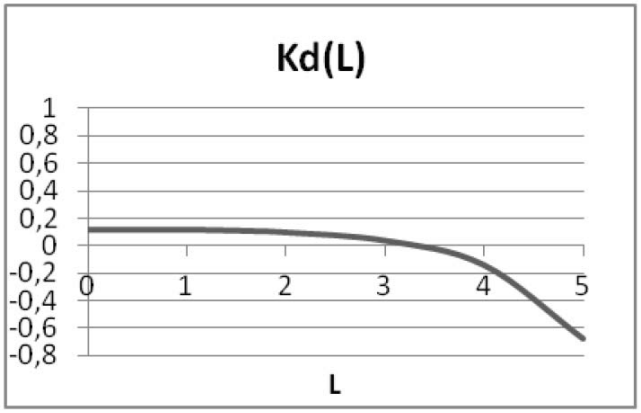

Figure 14: Dependence of debt cost k_d on leverage level *L* in case of its exponential decrease at $\alpha = 0.01$.

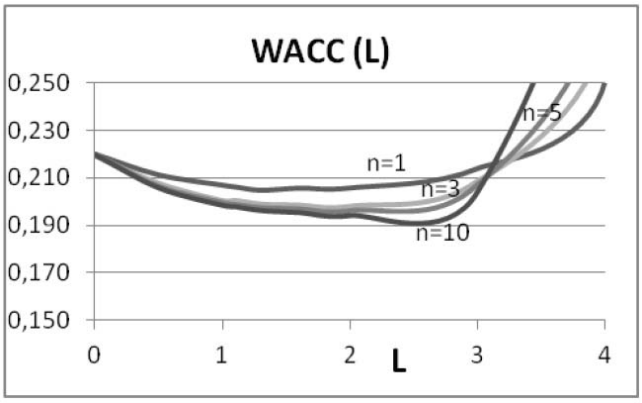

Figure 15: Dependence of weighted average cost of capital, WACC on leverage level *L* in case of exponential decrease of debt cost at $\alpha = 0.01$.

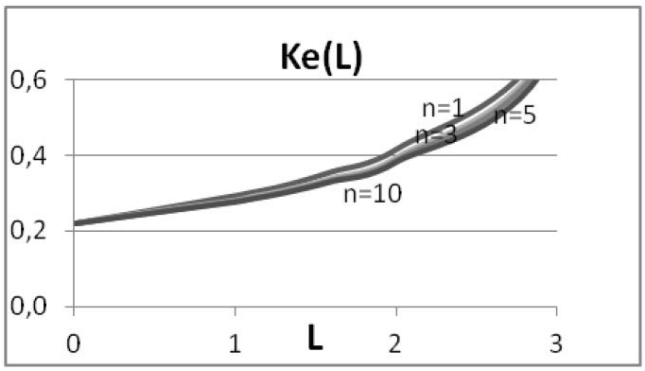

Figure 16: Dependence of equity cost k_e on leverage level *L* in case of its exponential decrease at $\alpha = 0.01$.

It was shown for the first time that valuation of WACC in the Modigliani – Miller theory (Modigliani *et al.* 1958; 1963; 1966) is not minimal and valuation of the company capitalization is not maximal, as all financiers supposed up to now: at some age of the company its WACC value turns out to be lower, than in Modigliani – Miller theory and company capitalization V

turns out to be greater, than V in Modigliani – Miller theory.

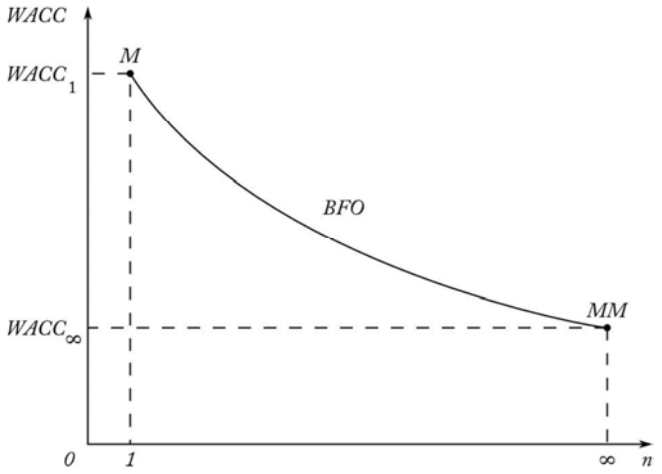

Figure 17: Monotonic dependence of weighted average cost of capital, WACC, on life–time of the company *n*.

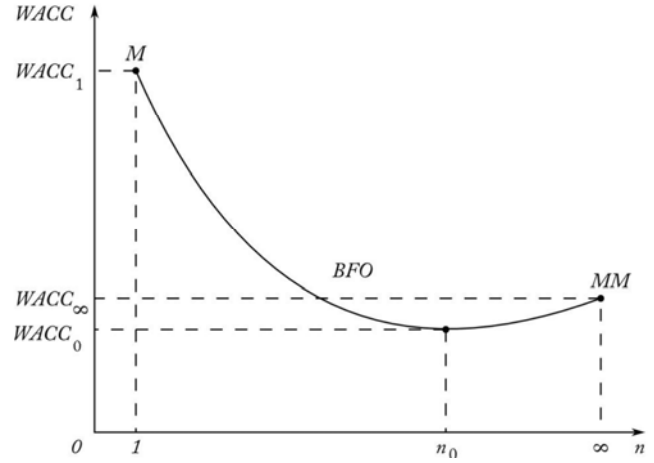

Figure 18: Dependence of weighted average cost of capital, WACC, on life–time of the company *n*, showing descending with n, and with the passage through a minimum and then a limited growth.

It was shown that, from the point of view of cost of attracting capital there are two types of dependences of weighted average cost of capital, WACC, on the time of life of company n: monotonic descending with n and descending with passage through minimum, followed by a limited growth. The first type takes place for the companies with low cost capital, characteristic for the western companies. The second type takes place for higher costs capital costs of the company, characteristic for the Russian companies as well as for companies from other developing countries. This means that latter companies, in contrast to the western ones, can take advantage of the benefits, given at a certain stage of development of company by discovered effect. Moreover, since the "golden age" of company depends on the company's capital costs, by controlling them (for example, by modifying the value of dividend payments, that reflect the equity cost), company may extend the "golden age" of the company, when the cost to attract capital becomes a minimal (less than perpetuity limit), and capitalization of companies becomes maximal (above than perpetuity assessment) up to a specified time interval.

Concluded that existed up to the present conclusions of the results of the theory of Modigliani–Miller (Modigliani *et al.* 1958; 1963; 1966) in these aspects are incorrect. We discuss the use of opened effects in developing economics.

The conclusion made in this Paper for the first time, that the assessment of weighted average cost of capital of the company, WACC, in the theory of Modigliani and Miller (MM) (Modigliani *et al.* 1958; 1963; 1966) is not the minimal, and capitalization is not maximal, seems to be very significant and important.

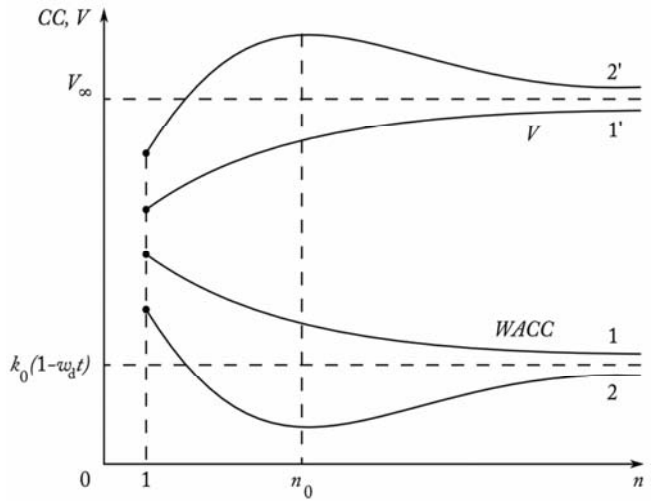

Figure 19: Two kind of dependences of weighted average cost of capital, WACC, and company capitalization, V, on life–time of the company *n*:

1–1' – monotonic dependence of weighted average cost of capital, WACC, and company capitalization, V, on life–time of the company *n*;

2–2' – showing descending of WACC with n, and with the passage through a minimum and then a limited growth and increase of V with the passage through a maximum (at n_0) and then a limited descending.

Below we show the dependence of weighted average cost of capital, WACC, on life–time of the company *n* at fixed value of equity cost, k_0 =20%, and at four values of debt cost.

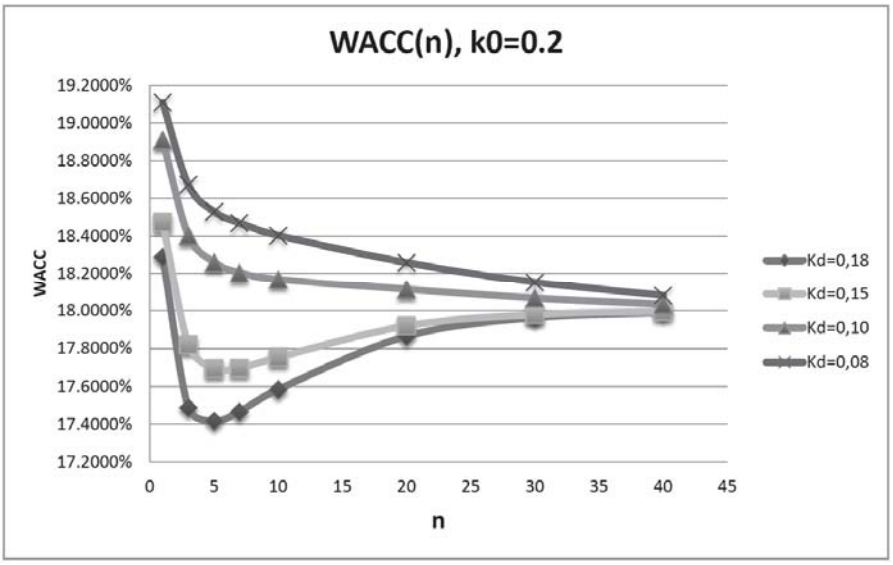

Figure 20: Dependence of weighted average cost of capital, WACC, on life–time of the company *n* at fixed value of equity cost, k_0 =20%, and at four values of debt cost, k_d =8%;10%;15% and 18% at leverage level L=1**.**

From Figure **20** it is seen, that with increase of debt cost, k_d, the character of dependence of weighted average cost of capital, WACC, on life–time of the company *n* is changed from monotonic descending of WACC with n to descending of WACC with n with passage through minimum, followed by a limited growth.

CONCLUSIONS

Above it is shown for the first time within BFO theory (Brusov *et al.* 2011a,b,c,d,e; 2012 a,b; 2013 a,b,c; 2014 a,b; Filatova *et al.* 2008), that valuation of WACC in the Modigliani – Miller theory (Modigliani *et al.* 1958; 1963; 1966) is not minimal and valuation of the company capitalization is not maximal, as all financiers supposed up to now: at some age of the company its WACC value turns out to be lower, than in Modigliani – Miller theory and company capitalization V turns out to be greater, than V in Modigliani – Miller theory (Modigliani *et al.* 1958; 1963; 1966). Thus, existing up to the present presentations concerning the results of the Modigliani–Miller theory in this aspect (Myers 1984) turn out to be incorrect.

It is shown that, from the point of view of cost of attracting capital there are two types of dependences of weighted average cost of capital, WACC, on the time of life of company n: monotonic descending with n and descending with passage through minimum, followed by a limited growth (there is a third modification of dependences WACC(n), which leaves all conclusions

Table 7: Dependence of WACC and k_e on Leverage Level for *n*=1, and $n = \infty$

L	Ko	Kd	t	n	Wd	WACC	BFO	Ke	WACC MM	MM Ke
0	0,2	0,15	0,2	1	0,00	20,00%	0,000	0,2000	20,00%	0,2000
1	0,2	0,15	0,2	1	0,50	18,43%	0,000	0,2487	18,00%	0,2400
2	0,2	0,15	0,2	1	0,67	17,91%	0,000	0,2974	17,33%	0,2800
3	0,2	0,15	0,2	1	0,75	17,65%	0,000	0,3461	17,00%	0,3200
4	0,2	0,15	0,2	1	0,80	17,50%	0,000	0,3948	16,80%	0,3600
5	0,2	0,15	0,2	1	0,83	17,39%	0,000	0,4435	16,67%	0,4000
6	0,2	0,15	0,2	1	0,86	17,32%	0,000	0,4922	16,57%	0,4400
7	0,2	0,15	0,2	1	0,88	17,26%	0,000	0,5409	16,50%	0,4800
8	0,2	0,15	0,2	1	0,89	17,22%	0,000	0,5896	16,44%	0,5200
9	0,2	0,15	0,2	1	0,90	17,18%	0,000	0,6383	16,40%	0,5600
10	0,2	0,15	0,2	1	0,91	17,15%	0,000	0,6870	16,36%	0,6000

Table 8: Dependence of WACC and k_e on Leverage Level for n=3, and $n = \infty$

L	Ko	Kd	t	n	Wd	WACC	BFO	Ke	WACC MM	MM Ke
0	0,2	0,15	0,2	3	0,00	20,00%	0,000	0,2000	20,00%	0,2000
1	0,2	0,15	0,2	3	0,50	17,80%	0,000	0,2360	18,00%	0,2400
2	0,2	0,15	0,2	3	0,67	17,06%	0,000	0,2719	17,33%	0,2800
3	0,2	0,15	0,2	3	0,75	16,69%	0,000	0,3078	17,00%	0,3200
4	0,2	0,15	0,2	3	0,80	16,47%	0,000	0,3436	16,80%	0,3600
5	0,2	0,15	0,2	3	0,83	16,32%	0,000	0,3795	16,67%	0,4000
6	0,2	0,15	0,2	3	0,86	16,22%	0,000	0,4153	16,57%	0,4400
7	0,2	0,15	0,2	3	0,88	16,14%	0,000	0,4511	16,50%	0,4800
8	0,2	0,15	0,2	3	0,89	16,08%	0,000	0,4869	16,44%	0,5200
9	0,2	0,15	0,2	3	0,90	16,03%	0,000	0,5228	16,40%	0,5600
10	0,2	0,15	0,2	3	0,91	15,99%	0,000	0,5586	16,36%	0,6000

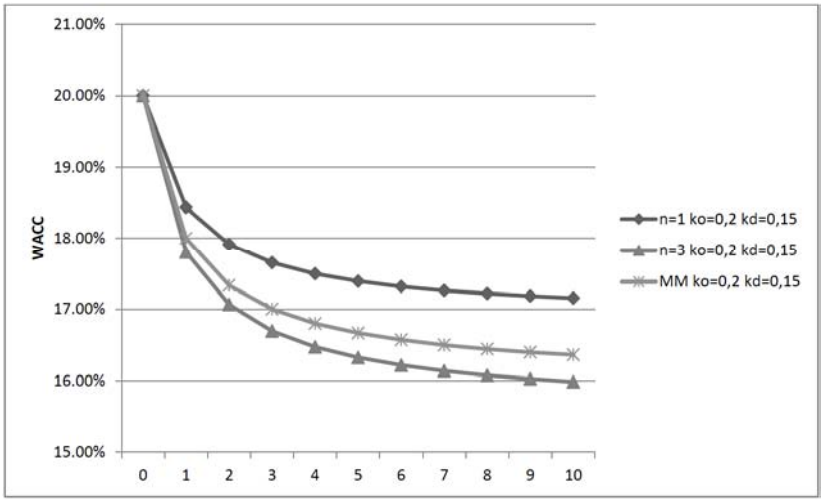

Figure 21: The curve *WACC*(*L*) for perpetuity company turns out to be not lowest for company with the effect of "golden age": the curve WACC(L) for three years company lies below the perpetuity curve.

valid). The first type takes place for the companies with low cost capital, characteristic for the western companies. The second type takes place for higher costs capital costs of the company, characteristic for the Russian companies as well as for companies from other developing countries. This means that latter companies, in contrast to the western ones, can take advantage of the benefits, given at a certain stage of development of company by discovered effect. (For example, the capitalization of Russian oil company "Rosneft' ", which has been valued in 2014 by Modigliani – Miller method, could be higher, accounting the discovered effect and BFO theory). Moreover, since the "golden age" of company depends on the company's capital costs, by controlling them (for example, by modifying the value of dividend payments, that reflect the equity cost), company may extend the "golden age" of the company, when the cost to attract capital becomes a minimal (less than perpetuity limit), and capitalization of companies becomes maximal (above than perpetuity assessment) up to a specified time interval.

It is important to note that "golden age" of company effect changes the dependence of WACC on L: the curve WACC(L) for perpetuity company turns out to be not lowest for company with this effect – as it is seen from Tables **6,7** and Figure **21** below the curve WACC(L) for three years company lies below the perpetuity curve.

8. INFLATION IN MM AND BFO THEORIES

Here we describe the influence of inflation on capital cost and capitalization of the company within modern

theory of capital cost and capital structure – Brusov–Filatova–Orekhova theory (BFO theory) (Brusov *et al.* 2011a,b,c,d,e; 2012 a,b; 2013 a,b,c; 2014 a,b; Filatova *et al.* 2008) and within its perpetuity limit – Modigliani – Miller theory (Modigliani *et al.* 1958, 1963, 1966) . By direct incorporation of inflation into both theories, Brusov–Filatova–Orekhova have shown for the first time, that inflation not only increases the equity cost and the weighted average cost of capital, but as well it changes their dependence on leverage. In particular, it increases growing rate of equity cost with leverage. Capitalization of the company is decreased under accounting of inflation.

Under accounting of inflation all original MM (Modigliani – Miller) statement have been modified as it done below.

2–nd original MM statement:

equity cost of leverage company k_e could be found as equity cost of financially independent company k_0 of the same group of risk, plus premium for risk, which value is equal to production of difference $(k_0 - k_d)$ on leverage level *L*.

2–nd modified MM–BFO statement:

under existing of inflation with rate α equity cost of leverage company k_e could be found as equity cost of financially independent company k_0 of the same group of risk, multiplied by (1+ α), plus inflation rate α and plus premium for risk, which value is equal to production of difference $(k_0 - k_d)$ on leverage level *L* and on multiplier $(1+\alpha)$.

4–th original MM statement:

equity cost of leverage company k_e paying tax on profit could be found as equity cost of financially independent company k_0 of the same group of risk, plus premium for risk, which value is equal to production of difference $(k_0 - k_d)$ on leverage level *L* and on tax shield (*1*–*T*) and on multiplier $(1+\alpha)$.

4–th modified MM–BFO statement:

equity cost of leverage company k_e paying tax on profit under existing of inflation with rate α could be found as equity cost of financially independent company k_0 of the same group of risk, multiplied by $(1+\alpha)$, plus inflation rate α and plus premium for risk, which value is equal to production of difference $(k_0 - k_d)$ on leverage level *L*, on tax shield (*1*–*T*) and on multiplier $(1+\alpha)$.

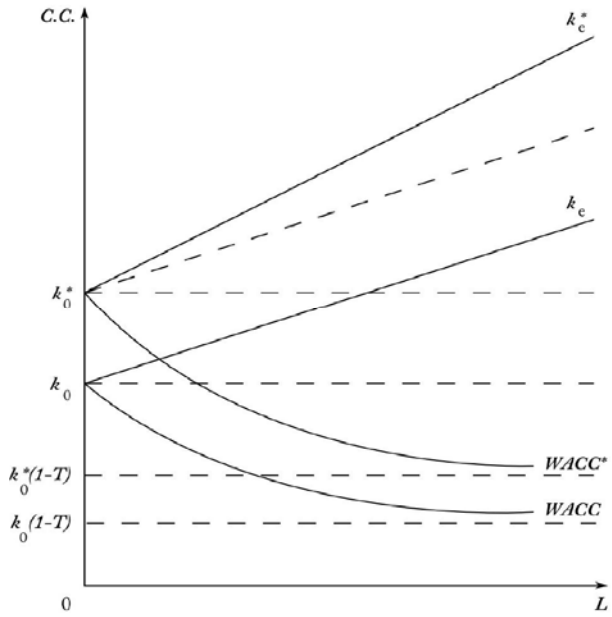

Figure 22: Dependence of the equity cost and the weighted average cost of capital on leverage in the Modigliani–Miller theory with taxing under accounting of inflation. It is seen, that growing rate of equity cost increases with leverage. Axis y means capital costs –C.C.

We generalized a very important Brusov–Filatova–Orekhova theorem under accounting of inflation.

Generalized Brusov–Filatova–Orekhova theorem

Under accounting of inflation without corporate taxing the equity cost k_0^*, as well as the weighted average cost of capital $WACC^*$ do not depend on company lifetime and are equal to

$$k_e^* = k_0^* + L\left(k_0^* - k_d^*\right) = k_0\left(1+\alpha\right) + \alpha + L\left(k_0 - k_d\right)\left(1+\alpha\right)$$

and $WACC^* = k_0^* = k_0\left(1+\alpha\right) + \alpha$. (3)

consequently.

It is shown, that inflation not only increases the equity cost and the weighted average cost of capital, but as well it changes their dependence on leverage. In particular, it increases growing rate of equity cost with leverage. Capitalization of the company is decreased under accounting of inflation.

Within modern theory of capital cost and capital structure – Brusov–Filatova–Orekhova theory (BFO theory) the modified equation for the weighted average

cost of capital, WACC, applicable to companies with arbitrary lifetime under accounting of inflation has been derived. Modified BFO equation allow to investigate the dependence of the weighted average cost of capital, WACC, and equity cost, k_e, on leverage level *L*, on tax on profit rate *t*, on lifetime of the company *n*, on equity cost of financially independent company, k_0, and debt cost, k_d, as well as on inflation rate α.

Using modified BFO equation the analysis of the dependence of the weighted average cost of capital, WACC, on debt ratio, w_d, at different tax on profit rate *t*, as well as inflation rate α has been done.

It has been shown, that WACC decreases with debt ratio, w_d, faster at bigger tax on profit rate *t*. The space between lines, corresponding to different values of tax on profit rate at the same step (10%), increases with inflation rate α. The variation region (with change of tax on profit rate *t*) of the weighted average cost of capital, WACC, increases with inflation rate α, as well as with lifetime of the company *n*.

9. EFFECTS, CONNECTED WITH TAX SHIELDS, TAXES AND LEVERAGE

The role of tax shields, taxes and leverage is investigated within the theory of Modigliani–Miller as well as within the modern theory of corporate finance by Brusov–Filatova–Orekhova (Brusov *et al.* 2011a,b,c,d,e; 2012 a,b; 2013 a,b,c; 2014 a,b; Filatova *et al.* 2008). It is shown that equity cost of the company as well as weighted average cost of capital decrease with the growth of tax on profits rates. A detailed study of the dependence of weighted average cost of capital $WACC$ and equity cost of the company k_e on tax on profits rates at fixed leverage level (fixed debt capital fraction w_d) as well as on leverage level (debt capital fraction w_d) at fixed tax on profits rate has been done. The dependences of weighted average cost of capital $WACC$ and equity cost of the company k_e on company lifetime have been investigated as well.

The concept "tax operating lever" has been introduced. For companies with finite life–time a number of important qualitative effects that do not have analogues for perpetuity companies has been detected.

One such effect – decreasing of equity cost with leverage level at values of tax on profits rate T, which exceeds some critical value T * – is described in details in Chapter 10 (at certain ratios between the debt cost and equity capital discovered effect takes place at tax on profits rate, existing in the western countries and in Russia, that provides practical value effect.) Its accounting is important in improving tax legislation and may change dividend policy of the company.

10. EFFECTS, CONNECTED WITH THE INFLUENCE OF TAX ON PROFIT RATE ON EFFECTIVENESS OF INVESTMENT PROJECTS

BFO authors have conducted the analysis of effectiveness of investment projects within the perpetuity (Modigliani–Miller) approximation (Modigliani *et al.* 1958, 1963, 1966) as well as within BFO theory. They analyzed the effectiveness of investment projects for three cases:

1) at a constant difference between equity cost (at $L = 0$) and debt cost $\Delta k = k_0 - k_d$;

2) at a constant equity cost (at $L = 0$) and varying debt cost k_d;

3) at a constant debt cost k_d and varying equity cost (at $L = 0$) k_0.

The dependence of NPV on investment value and/or equity value will be also analyzed. The results have been represented in the form of tables and graphs.

It should be noted that the obtained tables have played an important practical role in determining of the optimal, or acceptable debt level, at which the project remains effective. The optimal debt level there is for the situation, when in the dependence of NPV on leverage level L there is an optimum (leverage level value, at which NPV reaches a maximum value). An acceptable debt level there is for the situation, when NPV decreases with leverage. And, finally, it is possible that NPV is growing with leverage. In this case, an increase in borrowing leads to increased effectiveness of investment projects, and their limit is determined by financial sustainability of investing company.

11. INFLUENCE OF GROWTH OF TAX ON PROFIT RATE

Within modern theory of capital cost and capital structure by Brusov–Filatova–Orekhova (BFO theory) (Brusov *et al.* 2011a,b,c,d,e; 2012 a,b; 2013 a,b,c; 2014 a,b; Filatova *et al.* 2008) and created within this theory modern investment models influence of growth of tax on profit rate on the efficiency of the investment is investigated. It has been shown that for long term investment projects, as well as for arbitrary duration projects the growth of tax on profit rate change the nature of the NPV dependence on leverage at some

Table 9: Dependence of NPV and ΔNPV on Leverage Level *L* at Fixed Levels of Tax on Profit Rates t for 5–Year Project at t=0.3

L	Ko	Kd	Wd	t	n	NOI	Ke	NPV	ΔNPV
0	0.18	0.14	0	0.3	5	800	0.18	751.22	4.922709
1	0.18	0.14	0.5	0.3	5	800	0.197488	756.14	–36.8599
2	0.18	0.14	0.66667	0.3	5	800	0.214367	719.28	–44.7663
3	0.18	0.14	0.75	0.3	5	800	0.231082	674.51	–46.126
4	0.18	0.14	0.8	0.3	5	800	0.24773	628.39	–45.4549
5	0.18	0.14	0.83333	0.3	5	800	0.264343	582.93	–44.027
6	0.18	0.14	0.85714	0.3	5	800	0.280937	538.90	–42.3084
7	0.18	0.14	0.875	0.3	5	800	0.297518	496.60	–40.4978
8	0.18	0.14	0.88889	0.3	5	800	0.314091	456.10	–38.6879
9	0.18	0.14	0.9	0.3	5	800	0.330658	417.41	–36.9239
10	0.18	0.14	0.90909	0.3	5	800	0.34722	380.49	

Table 10: Dependence of NPV and □NPV on Leverage Level *L* at Fixed Levels of Tax on Profit Rates t for 5–Year Project at t=0.4

L	Ko	Kd	Wd	t	n	NOI	Ke	NPV	ΔNPV
0	0.18	0.14	0	0.4	5	800	0.18	501.04	64.13345
1	0.18	0.14	0.5	0.4	5	800	0.189578	565.18	4.73089
2	0.18	0.14	0.66667	0.4	5	800	0.19803	569.91	–9.5017
3	0.18	0.14	0.75	0.4	5	800	0.206172	560.40	–14.7815
4	0.18	0.14	0.8	0.4	5	800	0.214184	545.62	–17.1025
5	0.18	0.14	0.83333	0.4	5	800	0.22213	528.52	–18.1709
6	0.18	0.14	0.85714	0.4	5	800	0.230037	510.35	–18.6246
7	0.18	0.14	0.875	0.4	5	800	0.23792	491.73	–18.7461
8	0.18	0.14	0.88889	0.4	5	800	0.245786	472.98	–18.6762
9	0.18	0.14	0.9	0.4	5	800	0.253642	454.30	–18.4911
10	0.18	0.14	0.90909	0.4	5	800	0.261488	435.81	

Table 11: Dependence of NPV and ΔNPV on Leverage Level *L* at Fixed Levels of Tax on Profit Rates t for 5–Year Project at t=0.5

L	Ko	Kd	Wd	t	n	NOI	Ke	NPV	ΔNPV
0	0.18	0.14	0	0.5	5	800	0.18	250.87	116.0669
1	0.18	0.14	0.5	0.5	5	800	0.181448	366.94	41.1323
2	0.18	0.14	0.66667	0.5	5	800	0.181065	408.07	22.57738
3	0.18	0.14	0.75	0.5	5	800	0.180162	430.65	15.19888
4	0.18	0.14	0.8	0.5	5	800	0.179041	445.84	11.52994
5	0.18	0.14	0.83333	0.5	5	800	0.177806	457.37	9.446706
6	0.18	0.14	0.85714	0.5	5	800	0.176505	466.82	8.154973
7	0.18	0.14	0.875	0.5	5	800	0.175162	474.98	7.302458
8	0.18	0.14	0.88889	0.5	5	800	0.173792	482.28	6.713275
9	0.18	0.14	0.9	0.5	5	800	0.172401	488.99	6.291579
10	0.18	0.14	0.90909	0.5	5	800	0.170996	495.28	

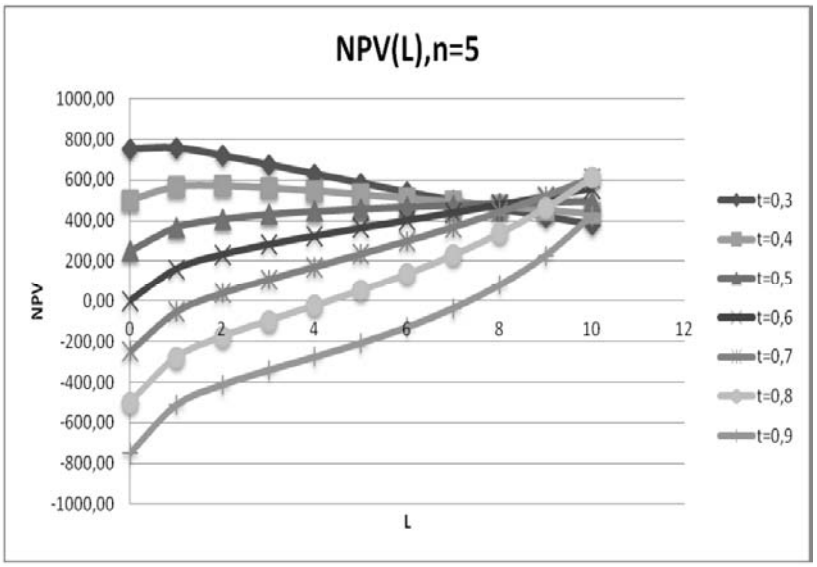

Figure 23: Dependence of NPV on leverage level *L* at fixed levels of tax on profit rates t for 5–year project.

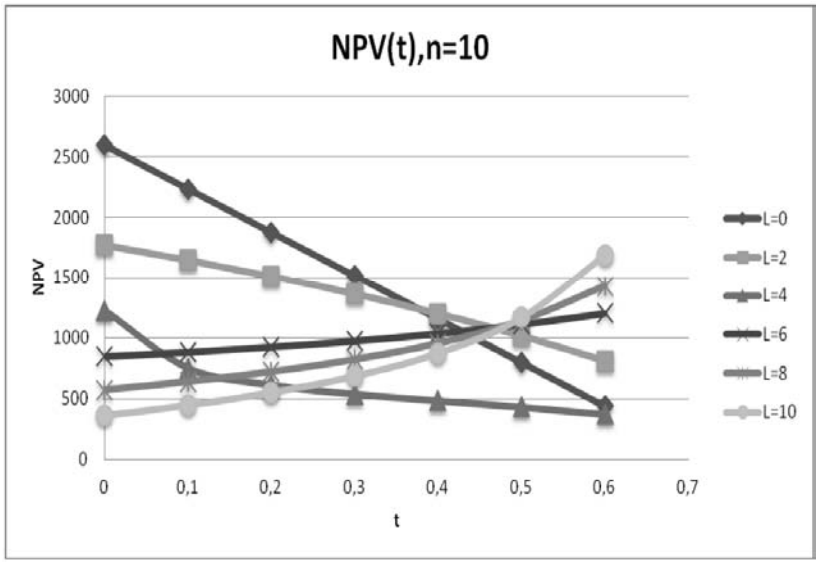

Figure 24: Dependence of NPV on tax on profit rate *t* at fixed leverage level *L* for 10-year project.

value t*: there is a transition from diminishing function NPV(L) when t<t* to growing function NPV(L). The t* value depends on the duration of the project, cost of capital (equity and debt) values and other parameters of the project.

At high leverage levels this leads to qualitatively new effect in investments: **growth of the efficiency of the investments with growth of tax on profit rate.** Discovered effects take place under consideration from the point of view of owners of equity capital as well as from the point of view of owners of equity and debt capital.

One can see from the Figures **23**, **24** that the nature of the NPV dependence on leverage at t*=0.5: there is a transition from diminishing function NPV(L) when t<t* to growing function NPV(L) at t>t*.

Within modern theory of capital cost and capital structure by Brusov–Filatova–Orekhova (BFO theory) and created within this theory modern investment models influence of growth of tax on profit rate on the efficiency of the investment is investigated. It has been shown that for arbitrary duration projects as well as for perpetuity projects the growth of tax on profit rate change the nature of the NPV dependence on leverage at some value t*: there is a transition from diminishing function NPV(L) when t<t* to growing function NPV(L). The t* value depends on the duration of the project, cost of capital (equity and debt) values and other parameters of the project.

At high leverage levels this leads to qualitatively new effect in investments: growth of the efficiency of the investments with growth of tax on profit rate**.** Discovered effects take place under consideration from the point of view of owners of equity capital as well as from the point of view of owners of equity and debt capital.

The observed at high leverage levels (starting from L= 6) increase of NPV with growth of the tax on profit rate *t* (Figure **24**) takes place at all values of *t*, that means that this is an entirely new effect in investments which can be applied in a real economic practice for optimizing of the management of investments.

So, two very important qualitatively new effects in investments has been discovered:

1) change the character of NPV dependence on leverage;

2) growth of the efficiency of the investments with growth of tax on profit rate.

Both effects could be used in practice to optimize the investments.

12. NEW APPROACH TO RATINGS

The first paper of this Special issue **"The ratings: new approach"** by Brusov P, Filatova T, Orehova N, Kulik V is devoted to application of the perpetuity limit of BFO theory (MM theory) to rating methodology: for the first time we will incorporate the main parameters of ratings – rating "ratios" – directly into modern capital structure theory. This allows to use the powerful methods and "toolkit" of this theory in rating and creates practically the new basis of a rating methodology, that allows make more correct ratings.

A new approach to rating methodology has been suggested, key factors of which are: 1) The adequate use of discounting of financial flows virtually not used in existing rating methodologies, 2) The incorporation of rating parameters (financial "ratios") into the modern theory of capital structure (BFO theory) (Brusov P *et al* 2015) (for beginning into its perpetuity limit). This on the one hand allows use the powerful tools of this theory in the rating, and on the other hand it ensures the correct discount rates when discounting of financial flows. Authors discuss also the interplay between rating ratios and leverage level which can be quite important in rating.

In the second paper of this Special issue **Rating methodology: new look and new horizons** by Brusov P, Filatova T, Orehova N, Kulik V the analysis of methodological and systemic deficiencies in the existing credit rating of non–financial issuers has been done. Paper is devoted to further development of a new approach to rating methodology suggested at first paper.

Authors have generalized it for the general case of modern theory of capital structure (Brusov–Filatova–Orekhova (BFO) theory): for companies of arbitrary age. A serious modification of BFO theory in order to use it in rating procedure has been required. It allows apply obtained results for real economics, where all companies have finite lifetime, introduce a factor of time into theory, estimate the creditworthiness of companies of arbitrary age (or arbitrary lifetime), introduce discounting of the financial flows, using the correct discount rate etc. This allows use the powerful tools of BFO theory in the rating. All these create a new base for rating methodologies.

In conclusion remind again that the introduction of the new system of evaluation of the parameters of financial activities of companies into the systems of financial reporting (IFRS, GAAP etc.) would lead to lower risk of global financial crisis.

ACKNOWLEDGMENTS

The research was supported by the Russian Foundation for Basic Research as part of Scientific ProjectNo. 17–06–00251A.

REFERENCES

Brusov P, Filatova T, Orehova N, Eskindarov M (2015) Modern Corporate Finance, Investment and Taxation. Springer International Publishing, 368 p.

Brusov P, Filatova T, Orehova N, Brusova A (2011a) Weighted average cost of capital in the theory of Modigliani–Miller, modified for a finite life–time company. Applied Financial Economics 21(11): 815–824

Brusov P, Filatova P, Orekhova N (2013a) Absence of an Optimal Capital Structure in the Famous Tradeoff Theory! Journal of Reviews on Global Economics 2: 94–116

Brusov P, Filatova P, Orekhova N (2014a) Mechanism of formation of the company optimal capital structure, different from suggested by trade off theory. Cogent Economics & Finance 2: 1–13 https://doi.org/10.1080/23322039.2014.946150

Brusov P, Filatova T, Orehova N *et al*. (2011b) From Modigliani–Miller to general theory of capital cost and capital structure of the company. Research Journal of Economics, Business and ICT 2: 16–21

Brusov P, Filatova T, Eskindarov M, Orehova N (2012a) Influence of debt financing on the effectiveness of the finite duration

investment project. Applied Financial Economics 22 (13): 1043–1052

Brusov P, Filatova T, Orehova N *et al.* (2011c) Influence of debt financing on the effectiveness of the investment project within the Modigliani–Miller theory. Research Journal of Economics, Business and ICT (UK) 2: 11–15

Brusov P, Filatova T, Eskindarov M, Orehova N (2012b) Hidden global causes of the global financial crisis. Journal of Reviews on Global Economics 1: 106–111

Brusov P, Filatova T, Orekhova N (2013b) Absence of an Optimal Capital Structure in the Famous Tradeoff Theory! Journal of Reviews on Global Economics 2: 94–116

Brusov P.N., Filatova T. V. (2011d) From Modigliani–Miller to general theory of capital cost and capital structure of the company. Finance and credit 435: 2–8.

Brusov P Filatova T Orehova N Brusov P.P Brusova N. (2011e) From Modigliani–Miller to general theory of capital cost and capital structure of the company. Research Journal of Economics, Business and ICT 2: 16–21

Brusov P Filatova T Orehova N (2014b) Inflation in Brusov–Filatova–Orekhova Theory and in its Perpetuity Limit – Modigliani – Miller Theory. Journal of Reviews on Global Economics 3: 175–185

Brusov P Filatova T Orehova N (2013c) A Qualitatively New Effect in Corporative Finance: Abnormal Dependence of Cost of Equity of Company on Leverage. Journal of Reviews on Global Economics 2: 183–193

Filatova T Orehova N Brusova A (2008) Weighted average cost of capital in the theory of Modigliani–Miller, modified for a finite life–time company. Bulletin of the FU 48: 68–77

Brusova A (2011) A Comparison of the three methods of estimation of weighted average cost of capital and equity cost of company. Financial analysis: problems and solutions 34 (76): 36–42

Modigliani F, Miller M (1958) The Cost of Capital, Corporate Finance, and the Theory of Investment. American Economic Review 48: 261–297

Modigliani F, Miller M (1963) Corporate Income Taxes and the Cost of Capital: A Correction. American Economic Review 53: 147–175

Modigliani F, Miller M (1966) Some estimates of the Cost of Capital to the Electric Utility Industry 1954–1957 . American Economic Review 56: 333–391

Myers S (2001) Capital Structure. Journal of Economic Perspectives 15(2): 81–102
https://doi.org/10.1257/jep.15.2.81

Received on 28-11-2017 Accepted on 01-01-2018 Published on 09-03-2018

DOI: https://doi.org/10.6000/1929-7092.2018.07.08