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REFUTATION OF THE THEORY OF "COMPOUND INTEREST EFFECT" IN THE CAPITALIZATION OF DIVIDENDS

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Abstract
The purpose of this work is to clarify the causes and circumstances of the negative influence of the compound interest effect in investment processes and to refute the theory of the compound interest effect in the capitalization of dividends. The article considers the peculiarities of the negative effect of the compound interest effect in terms of capitalization of dividends. The reasons and circumstances of the negative value of the corresponding effect in investment processes were specified. It is stated that the effect of compound interest is often not positive at all in case of capitalization of dividends on shares. Dividend tax neutralizes the "magic of compound interest" in the case of appropriate capitalization of dividends. The payment of dividends is economically feasible only when the investor plans to direct these funds to consumption and not to capitalization. To improve the conditions of investment processes, the need to reduce the tax on dividends has been proven. It showed the possibility of avoiding the tax on dividends for investors in the case of its relatively large size. The material of the article allows us to refute the theory of the "compound interest effect" in the capitalization of dividends.

Keywords: *compound interest effect, dividends, capitalization, dividend tax, investment processes.*
JEL codes: *Q16, M10.*

Introduction

In investment processes, the effect or strength of compound interest is a significant factor in the choice of investment objects, calculations and determination of investment efficiency. This effect allows you to accelerate the rate of increase in investor capital. It is often compared to a snowball that rolls from above and absorbs the accompanying snow on its way, thus increasing gradually and accelerating its speed. The subject of the compound interest effect is popular on Internet courses and video blogs devoted to investment processes and the stock market. The compound interest effect is often referenced by appropriate "curators" and "bloggers" to involve individuals in investment processes. This effect is attributed to the magical properties of capital increase: it seems that it will make the investor rich and prosperous.

However, this effect is not always positive. Sometimes its strength is somewhat negative. In addition, such a negative value can grow and accelerate like a "snowball".

Analysis of recent research and publications in the field of Lewin C.G., Oscar Varela, Khaled Abdou, Berk, Jonathan, Peter DeMarzo, Jarrad Harford, Brigham Eugene F., Joel F. Houston Ross, Stephen A., Randolph W. Wester Field, Bradford D. Jordan, Eric Saidel, Pournara Craig, Pournara C., Craig R.M. Mckenzie, Michael J. Liersch [1-10] – shows some interest in the compound interest effect, but it is considered only from a

positive perspective. In domestic textbooks on corporate finance and investment activities, such effect of compound interest has become an indisputable axiom. Scientific publications do not address this topic in terms of discussions of the reality of the positivity of the strength of compound interest and discussions of relevant opinions. Recent foreign publications [1-8], which deal with compound interest, also do not question the positive effect of the corresponding interest. Therefore, for the sake of objectivity, it is necessary to consider the negative nature of the effect of compound interest in investment processes.

Many works, including of Lewin C.G. [1], are devoted to the study of a compound interest in lending: bank or commercial credit. It should be noted that interest calculation in the case of loans and deposit transactions is usually not taxable. Therefore, the effect of a compound interest in these of processes is considered as a factor of additional enrichment of the capital owner. The works, in particular of Craig R.M. Mckenzie and of Michael J. Liersch [9], often focus on underestimating the effect of a compound interest in investment processes.

The **problem** is that many researchers do not see the failure of the theory of the compound interest effect in the capitalization of dividends. Therefore, it is important to prove the hypothesis of the failure of the theory in the case of dividend payments as a result their taxation.

The purpose of this work is to clarify the causes and circumstances of the negative influence of the compound interest effect in investment processes and to refute the theory of the "compound interest effect" in the capitalization of dividends.

The object of study is the capitalization of dividend payments in investment processes.

The research methods are based on an experiment using economic and mathematical modelling. The initial conditions were chosen for its implementation, which is the same for different options: the initial amount of investment, the term of investment, and the amount of "simple" interest. Using the compound interest formula (1), calculations were made under different investment conditions, and, in particular, under conditions of investment in dividend shares, including at different terms of payment of dividends and taxes. Besides, an analysis of the dynamics of stock prices of two corporations operating in different stock markets and pursuing different dividend policies was carried out. The research period where it was chosen is 15 years.

In substantiating our provisions, we did not limit ourselves to a specific region, so we considered the global stock market. In particular, when choosing examples of corporations that pay and ignore dividends, we took corporations in different countries. Although it should be recognized that the leader in the world stock market is the United States. When developing recommendations for improving state regulation of investment processes, we took into account the level of dividend tax in Ukraine.

Results

Let us clarify that the effect of compound interest in investment processes occurs only under the conditions of capitalization of the relevant interest. This key position is the starting and important principle that is crucial in our study.

It should also be clarified that the effect of compound interest occurs when the latter is calculated by the formula of compound interest:

$$FV = PV \cdot (1 + i)^n \qquad (1)$$

FV - the final amount of funds, taking into account the interest received, cash.

PV - the initial amount of investment, money.od.

i - interest rate;

n is the number of periods for which funds are invested.

Dimension "I" must correspond to "n". That is if we have "and" - the annual rate, then "n" – is measured in years.

We gave this formula because there is an alternative: the formula of simple interest:

$$FV = PV \cdot (1 + n \cdot i) \qquad (2)$$

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The main difference is that according to the compound interest formula, further interest amounts are accrued both on the initial amount of investment and on the amount of interest that has been accrued earlier. That is the capitalization of interest. In practice, the simple interest formula is hardly used or is used when n = 1. The larger n - the greater the effect of compound interest. The phenomenon when we have further interest accrued on both the initial amount of investment and on previously accrued interest is called the power of compound interest or their magic because in each subsequent period (n) the number of interest increases.

For example, let us take the initial investment of $ 1,000, and we will calculate the amount of interest in two ways: 1-option - at simple interest at a rate of 12% per annum; Option 2 - at compound interest based on the rate of 1% per month. At first glance, equivalent, but no.

According to the first option: FV = 1000 • (1 + 0.12) = 1120.00 dollars.

According to the second option: FV = 1000 • (1 + 0.01) 12 = 1126.83 dollars.

As you can see, the difference is $ 6.83 in favor of compound interest. Let us present the last calculation in the table (table 1).

Table 1. Schematic calculation of interest by the formula of compound interest

Month	Body of the deposit (initial amount of investment plus accrual of interest), at the beginning of the month, USD	Accrued interest for the month, USD	Body of the deposit (initial amount of investment plus accrual of interest) at the end of the month, USD
1	1000,00	10,00	1010,00
2	1010,00	10,10	1020,10
3	1020,10	10,20	1030,30
4	1030,30	10,30	1040,60
5	1040,60	10,41	1051,01
6	1051,01	10,51	1061,52
7	1061,52	10,62	1072,14
8	1072,14	10,72	1082,86
9	1082,86	10,83	1093,69
10	1093,69	10,94	1104,62
11	1104,62	11,05	1115,67
12	1115,67	11,16	1126,83
Together		126,83	

As you can see from the table. 1. the amount of interest is constantly growing. In addition, the increase in the amount of interest has a nonlinear form (Fig. 1):

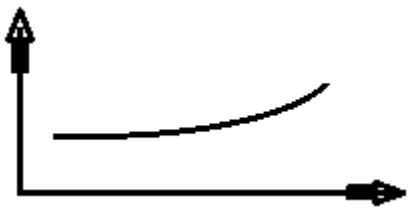

Figure 1. The nonlinear nature of the increase in the amount of interest under the conditions of using the compound interest formula

This is the so-called "power" or "magic" of compound interest. In addition, the more often the interest is accrued, the greater the effect of compound interest.

The material of the 3rd year of the university is indicated above, but why cite it? Based on these data, we will form further calculations that will allow us to prove alternative positions on the effect of compound interest.

Our thesis is that the above effect has a positive influence only in those cases that do not relate to the stock market, and in particular, stocks. That is, we can talk about the magic of compound interest in the case of loans, deposits, bonds, but for stocks - no.

Dividends on shares are taxed, which is the main reason that neutralizes the positive value of the effect, especially when the capitalization of such interests.

The second important thesis is that the share price "includes everything": dividends (including taxes), expectations, risks, goodwill and so on. It is under such conditions that the effect of compound interest in the capitalization of dividends will be negative when the price is "all inclusive". Not all stock markets meet this condition. For example, the widespread US stock market does, Russia does not yet, and Ukraine has a minimum dividend tax (5%), which makes it appropriate to transfer business to Ukraine.

Russia was chosen as an example because, since 2019 the country has significantly changed the terms of dividend payment for a significant number of companies that are "blue chips" in the stock market. If by 2019 many of them worked, earned a profit, did not pay dividends, but the shares of the respective companies almost did not grow. Since 2019, when they were required to pay dividends, stocks have also risen. This is a phenomenon of the stock market, which is just passing the stage of formation. National investors began to compare the shares of these companies with bonds, taking into account the risk and began to form a new price for shares of Russian companies: without taking into account the amount of profit remaining in the company. However, in the Russian stock market, we can often see the so-called "dividend gap" - a sharp drop in stock prices after the payment of dividends. Let us clarify that the size of the corresponding reduction also includes the tax.

The US stock market is the opposite. If a company operates successfully and makes a profit, then its shares rise in price even if dividends are not paid. It is in the American stock market, where the world's major corporations are concentrated, that the thesis is "the price includes everything".

When dividends are paid, the share price is reduced by the total amount (including taxes), while the capitalization is carried out by the amount of dividends without taxes. Consider this case in our numerical example (table 2). Different countries have different dividend tax rates, in our example, we will take the average rate of 15%.

As you can see from table.2. the body of the brokerage deposit is constantly decreasing, and the amount of dividends is also decreasing. Under conditions when our economic results are constant (do not increase), and all profits are paid in the form of dividends, such while their capitalization is carried out, the tax on dividends neutralizes the positive value of the compound interest effect.

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Table 2. An example the negative effect of compound interest in the payment and capitalization of dividends (dividends - 1% per month, tax - 15%)

Month	Body of the brokerage deposit (initial amount of shares plus net dividends), at the beginning of the month, USD	Accrued amount of dividends per month, USD	Dividend tax, USD	Amount of dividends without tax, USD
1	1000,00	10,00	1,50	8,50
2	998,50 (1000,00 – 10,00 + 8,50)	9,99	1,50	8,49
3	997,00	9,97	1,50	8,47
4	995,51	9,96	1,49	8,46
5	994,01	9,94	1,49	8,45
6	992,52	9,93	1,49	8,44
7	991,03	9,91	1,49	8,42
8	989,55	9,90	1,48	8,41
9	988,06	9,88	1,48	8,40
10	986,58	9,87	1,48	8,39
11	985,10	9,85	1,48	8,37
12	983,62	9,84	1,48	8,36
1	**982,15**			
	Together:	119,01	17,85	

The more often dividends are paid and the larger they are, the greater the total amount of taxes and, consequently, the loss of shareholders due to falling stock prices. The dividend tax is a significant economic brake on the capitalization of dividends and, consequently, investment processes.

In practice, the growth of a corporation's profits can offset the negative effects of taxation, but still, the growth rate of its share price will be slower than when the amount of dividend payments is minimal.

For comparison, consider the situation according to our example, when dividends are paid four times a year at a rate of 3% per quarter (Table 3.). At the same time, our tax on dividends will be the same as in Ukraine - 5%. Note that for all examples the interest meets to "simple" rate of 12% per annum.

Table 3. An example the negative effect of compound interest in the payment and capitalization of dividends (dividends - 3% per quarter, tax - 5%)

Quarter	Body of the brokerage deposit (initial amount of shares plus net dividends), at the beginning of the quarter, USD	Accrued amount of dividends per quarter, USD	Dividend tax, USD	Amount of dividends without tax, USD
1	1000,00	30,00	1,50	28,50
2	998,50 (1000,00 – 30,0 + 28,5)	29,96	1,50	28,46
3	997,00	29,91	1,50	28,41
4	995,51	29,87	1,49	28,37
1	**994,01**			
	Together:	119,73	5,99	113,74

As can be seen from table 3. with a decrease in the frequency of dividend payments and, in particular, dividend tax, the

negative effect of compound interest in the payment and capitalization of dividends is smaller. Therefore, it is expedient for enterprises to reduce the frequency of dividend payments, and to reduce the tax on dividends for the national economy in order to support investment processes.

The payment of dividends is economically feasible only when the investor plans to direct the relevant funds for consumption and not for capitalization.

For comparison, consider the dynamics of shares of two corporations (the one that pays dividends and the other does not), which operate in different stock markets: Russia and the United States.

Figure 2. Dynamics of Gazprom share price (Russian gas company)

In Fig.2. an example of a situation was given when the company worked and increased its profit, but the price of its shares did not increase. Only in 2019, when the payment of dividends became mandatory it increased rapidly. The fall in 2020 corresponds to the global fall in energy prices. The latest amount of Gazprom's dividends is almost 9%, which exceeds the interest rates on Russian bonds. That is, the share price does not include profit growth and is formed on the principle of comparing investment alternatives (in this case in bonds and bank deposits).

Figure 3. Dynamics of Google's share price (US stock market)

Google does not pay dividends at all, but its share price increases by an average of 19.5% per year. The share price includes profit growth.

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Comparing the two cases allows you to prefer investing in Google stocks. In addition, investing in such securities frees the investor from the negative effects of dividend tax. The capitalization of the corporation's profit is carried out within the corporation itself, which leads to an increase in its price and the profit of the investor - its shareholder.

Conclusions

The research results make it possible to refute the theory of the "compound interest effect" in the capitalization of dividends.

Regarding the payment of dividends on shares and their subsequent capitalization, the effect of compound interest has the opposite effect due to taxation.

It is proved that the payment of dividends is economically feasible only when the investor plans to direct the relevant funds for consumption and not for capitalization.

It is determined that the tax on dividends is an economic brake on investment processes. Since dividends are the part of the company's net profit, which (i.e profit) has previously been subject to income tax, the tax on dividends should be minimized. The opposite phenomenon turns the effect of compound interest in investment processes into a negative factor, which "magically" reduces the investor's capital and worsens the conditions of investment activity in the country.

The negative effect of compound interest on dividend payments and their subsequent capitalization is manifested in such a stock market, where the share price is formed on an all-inclusive basis. Not all countries have a stock market that meets this condition.

To summarize, the dividend tax is an additional income tax that an enterprise can evade. An investor can also avoid the negative effect of the compound interest effect on dividends by purchasing dividend-free shares of enterprises.

References

Lewin C.G. (2019). The Emergence of Compound Interest // British Actuarial Journal. Vol. 24. e34: 1–27.- https://doi:10.1017/S1357321719000254

Oscar Varela, Khaled Abdou (2012). A Note: Should Investors Prefer Compound Interest? Not Always //Journal of Financial and Economic Practice. Vol. 12. Issue 3: 29 – 36.

Berk, Jonathan, Peter DeMarzo and Jarrad Harford (2009). Fundamentals of Corporate Finance // Pearson Education. MA. USA: 104-108.

Brigham, Eugene F. and Joel F. Houston (2010). Fundamentals of Financial Management, Concise 6th Edition // South-Western Cengage Learning. Ohio, USA: 134-139.

Ross, Stephen A., Randolph W. Wester Field and Bradford D. Jordan (2008). Essentials of Corporate Finance, 6th Edition, McGraw-Hill/Irwin. New York. USA: 129-136.

Eric Saidel (2000). The Compound Interest Effect: Why Cultural Evolution Is Not Niche Construction // Behavioral and Brain Sciences. Vol. 23. Issue 1: 158-159. - https://doi.org/10.1017/S0140525X00372417

Pournara Craig (2013). Teachers' Knowledge for Teaching Compound Interest // Pythagoras. Vol 34. No 2: 238. - https://doi.org/10.4102/pythagoras.v34i2.238

Pournara, C. (2012). Does the Compound Interest Formula Give Us the 'Real' Answer? // Learning and Teaching Mathematics. Vol. 12: 24–26.

Craig R.M. Mckenzie and Michael J. Liersch (2011). Misunderstanding Savings Growth: Implications for Retirement Savings Behavior. Journal of Marketing Research. Vol. 48.: S1-S13.

Morhachov I., Koreniev E., Chorna O., Khrystenko L. (2019). Regional Regulation of Investment Activity in Developing Countries: Example of Ukraine // Management Theory and Studies for Rural Business and Infrastructure Development. Vol. 41. No. 2: 168–182. -https://doi.org/10.15544/mts.2019.15

Morhachov I., Ovcharenko Ie. (2020). Prerequisites for Successful Regulation of Regional Investment Processes // Management Theory and Studies for Rural Business and Infrastructure Development. Vol. 42. No. 3: 289-294. -https://doi.org/10.15544/mts.2020.28