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Original Paper

Modelling the impact of loan repayment deferrals on the amount of farm interest costs during the COVID-19 pandemic

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ABSTRACT

During the years 2020-2022, the world was dominated by the Covid-19 pandemic. Companies, as well as the population, felt financial difficulties due to the pandemic, and therefore they were forced to accept help from the banks. Central banks, as well as commercial banks, tried to introduce as many measures as possible to help clients, as they realized that client's problems could easily be transferred to the banking sector, which is very sensitive to credit risk. These measures concerned the agricultural sector, too. However, some measures taken by the banks brought additional financial costs to the farms, which the farms were often unaware of. Therefore, the main goal of this article is the valuation of selected measure in the banking sector to mitigate the negative effects during the COVID-19 pandemic crisis, with a focus on modelling the impact of loan repayment deferrals on the amount of farm interest costs. We developed an initial model to assess the effects of deferring loan repayments on farm interest expenses, from which we generated four distinct loan repayment variations. Variant III emerged as the most beneficial option, wherein the deferral of loan repayments was solicited after 15 years of repayment, corresponding to the completion of 75% of the payback period, without extending the loan repayment duration. The results show generally that the most unfavourable deferment of loan repayments was for farms that were at the beginning of repaying their loans and at the same time requested an extension of the loan maturity period.

KEYWORDS: loans, interest cost, COVID-19 pandemic crisis, farms

JEL CLASSIFICATION: E47, G21, Q14

INTRODUCTION

The global COVID-19 pandemic has affected the whole world. No one predicted the outbreak of the pandemic in mid-January 2020. However, by the end of March in 2020, the pandemic affected many enterprises not only in the entire EU. Member States introduced strict curfews and shops, schools, and enterprises were closed. This made it difficult not only to do business. Strained supply chains, problems in production, and limited demand have significantly hampered the sales and cash flows of enterprises in the EU [9]. Measures related to the COVID-

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19 pandemic have caused the largest disruption to the global economy in the world since the World War II. Due to the elimination of impending bankruptcies of enterprises, the prevention of the increase in unemployment, the elimination of the disruption of global financial flows the solution in each country was the implementation of government fiscal support measures for enterprises. The long-term impact of these measures on aggregate productivity is still unknown [4]. The COVID-19 pandemic has led to the biggest economic decrease in the world since the Great Depression. An economic crisis is usually accompanied by financial crisis. There were concerns that the restrictions and measures related to COVID-19 will also affect the economic results of banks. This would subsequently worsen the economic decline in the country. Opposite to expectations, however, the banking sector has proven strongly resistant during the COVID-19 pandemic. It remained questionable whether the resilience of banks was due to stricter regulatory requirements for banks, or due to the massive government fiscal supports [5]. The implementation of the lockdown in countries to stop the virus forced enterprises and institutions to limit their activities or even to stop production. Health care, food sector and agriculture were however essential for the basic needs of the population [7]. The Organisation for Economic Co-operation and Development distinguished four groups of measures [11]. First group was represented by the work-oriented measures to eliminate the increase in unemployment, to ensure stability in, keep employment or support for job creation. The second group included measures such as deferrals of taxes, social contributions, and tariffs. The penultimate group represented more targeted support such as direct financing, loans or guarantees and the last group was for structural policies [10]. Governments became even more aware of the role of SMEs for the economy during the negative impact of the COVID-19 epidemic. Many measures were implemented, mainly in the field of SMEs financing [14]. As a result of the outbreak of the COVID-19 pandemic, the related measures and restrictions, the volume of non-performing loans increased. Central banks and politics adopted policies to help problematic sectors react to this situation. In particular, the bank sector had problems with less liquidity due to the decrease of payments by affected borrowers [2]. The volume of total loans and the volume of defaulted loans of banks and financial institutions is an important indicator of economic activity and its riskiness. COVID-19 affected borrowers' ability to repay their obligations, which also had an impact on overall lending activity [2]. The COVID-19 pandemic has significantly affected the solvency of SMEs, not excluding farms. The risk management of financial institutions and banks have tightened measures and requirements when providing new loans to clients. During the pandemic, the availability of loans for SMEs also worsened. Therefore, countries around the world have implemented various tools and programs to support the repayment of loans or for deferral repayments [14]. According to the Oxford University database, up to 173 countries have applied such programs and tools until mid-2021. For example, in the USA, by the end of 2020, there were 2 trillion dollars' worth of land in the deferment program (affecting 60 million individuals). In Hungary, such a repayment deferment program was the main economic policy tool and participation was mandatory for banks [3]. The COVID 19 pandemic had a negative impact on the financing of small and medium-sized enterprises. The enterprise's cash flows decreased and, on the contrary, indebtedness increased. Especially for smaller enterprises. Governments should help SMEs by providing incentives like loan guarantees or tax credits. Banks should provide to enterprises flexible repayment periods, bridge financing, etc. in times of crisis [9], [14]. The decreased default risk of borrowers and thereby reduced banks' loan portfolio risk during the COVID-19 crisis [5]. In the empirical literature about support programs is written, that on the one side they can temporarily overcome the crisis. On the other side, they can increase the moral hazard, leading to a higher default risk in the long run. In general, these

programs have been found to be effective as a policy tool, but ineffective in the long run [3]. Financial performance in the agricultural sector can be measured in terms of farm net income, asset value and debt obligations [6]. The agriculture sector faced the most severe financial crisis in the early and mid-1980's since the Depression. A lot of farmers didn't repay debt obligations-due to falling farm income, commodity prices and land value, that was used as the guarantee for their debts [8]. Principal repayments can be rescheduled or deferred. Rescheduling, or rewriting short-term debt to a longer repayment schedule, has been used by some short-term lenders on situations where the borrower has additional borrowing capacity and represents a reasonable credit risk. The fundamental underlying assumption of principal rescheduling and deferral options is that the inability to repay debt is a temporary situation that, given time, is correctable at the firm or sector level. The primary difficulty with that assumption is that it rests upon the lender's ability to forecast when, and if, repayment capacity will be restored. In the interim, the lender's cash flow may be substantially reduced, and the risk of loss is increased as the carrying costs of debt accumulate. In the situation a well-diversified lender, or one with a relatively high capital position would be better able to make concessions on principal repayment than a specialized, low-capital lender. Regardless of the lender's position, however, voluntary modification of the principal repayment schedule is not expected to provide the level of relief that highly leveraged farm borrowers need to correct the imbalance between low earnings and high debt repayment obligations [13].

MATERIAL AND METHODS

We had created a basic model for evaluating the impact of deferring loan repayments on the amount of farm interest costs and from it, we derived 4 different variants of loan repayment, i.e. repayment plans. These were variants that could arise during the COVID-19 pandemic crisis and could subsequently were used by farms (in borrower position) in case of inability to repay the loan. These are the following 4 variants:

I. Repayment plan with deferring 9 monthly loan repayments after completing 5 years of repayment (after 60 loan repayments). The repayment plan will not be extended (maintaining the final maturity), but the remaining loan repayments will be increased by unpaid interest.

II. Repayment plan with deferring 9 monthly loan repayments after the end of 5 years of repayment (after 60 loan repayments). The repayment plan will be extended by 9 months.

III. Repayment plan with deferring 9 monthly loan repayments after the completing 15 years of repayment (after 180 loan repayments). The repayment plan will not be extended, but the remaining loan repayment will be increased by unpaid interest.

IV. Repayment plan with deferring 9 monthly loan repayments after the completing 15 years of repayment (after 180 loan repayments). The repayment plan will be extended by 9 months.

The basic model is based on the following assumptions:
- Loan amount: 100,000 EUR,
- Repayment period: 20 years (240 months),
- Interest rate of 1.5% p. a., and we assume that it will not be changed over all period.

The amount of the monthly total loan repayment (annuity) is calculated:

$$R = D * \left[\frac{\frac{i}{m}*(1+\frac{i}{m})^{n*m}}{(1+\frac{i}{m})^{n*m}-1}\right] \qquad (1)$$

where:
R = the amount of the monthly total loan repayment (annuity), which contains interest payment and principal loan payment, D = loan amount, i = annual interest rate (p. a.), n = number of years of loan repayments, m = frequency of attribution of annual interest rate (p.a.)

We calculated the total amount of overpaid interest (U):
$$U = R * m * n - D \qquad (2)$$

RESULTS AND DISCUSSION

According to the Act on certain extraordinary measures in the financial field in connection with the spread of the dangerous contagious human disease COVID-19 No. 67/2020 Coll., the client - a self-employed person and SMEs could apply for a legal deferral of loan repayments for a maximum period of 9 months. Client, who:
- Has up to 250 employees,
- Has an annual turnover of up to 50 mil. EUR or the total annual balance does not exceed 43 mil. EUR,
- Got into financial problems due to the coronavirus pandemic.

During the COVID-19 pandemic the deferment of loan repayment could had a form of instalments of the loan principal, principal and loan interest or the maturity of a one-time loan. The borrower can agree with the creditor (bank) on the payment of interest during the deferment of loan repayment, otherwise the creditor will allocate the unpaid interest for the period of deferment of loan repayment to the remaining instalments of the loan due after the expiry of the period of deferment of loan repayment. The creditor and the borrower can agree whether, after the end of the loan repayment deferral, there will be an increase in instalments while maintaining the final maturity of the loan or whether the final maturity of the loan will be extended [12].

Based on the basic model presented in the methodology, we calculated that the monthly total loan repayment (annuity) for a farm with a loan of 100,000 EUR, a repayment period of 20 years and an interest rate of 1.5% would be 482.55 EUR.

$$482.55 = 100,000 * \left[\frac{\frac{0.015}{12}*(1+\frac{0.015}{12})^{20*12}}{(1+\frac{0.015}{12})^{20*12}-1}\right]$$

In this basic model, the farm will pay a total of 15,810.90 EUR in interest over the all period.

$$15{,}810.90 = 482.55 * 12 * 20 - 100{,}000$$

Variant I

The first analysed variant is a repayment plan with a deferring 9 monthly loan repayments after the end of 5 years of repayment (after monthly 60 loan repayments), while the repayment plan is not extended, but the remaining loan repayments will be increased by unpaid interest. We present the results of the calculations in table 1. We can see that the first 60 loan repayments were made as in the basic variant, i.e. the monthly annuity payment was in the amount of 482.55 EUR. After 60 regular loan repayments, the deferral of loan repayments was implemented, while no interest was paid during this deferral. The rest debt was automatically increased by the amount of unpaid interest, and thus the borrower's obligation to the bank increased. This increased debt (loan) earned interest again. This resulted in an increase in the loan by 878.92 EUR. After 9 months, a new annuity was calculated in sum 510.91 EUR according to formula (1), while 171 periods were used (n*m was equal to 240-69) and the debt amounted was 78,615.67 EUR. In this variant 1, the farm would pay back to the bank a total of **116,318.47 EUR** (60*482.55 + 171*510.91). After deducting the total loan principal in the amount of 100,000.00 EUR and the overpaid interest in the basic variant in the amount of 15,810.04 EUR, the farm overpaid due to the deferral of the loan repayments a total of **507.58 EUR** more.

Table 1 Calculation results in variant I

Order of loan repayment	Loan balance at the beginning of the period	Principal loan payment	Interest paid	Total loan repayment (annuity)
1	100,000.00 €	357.55 €	125.00 €	482.55 €
60	78,121.64 €	384.89 €	97.65 €	482.55 €
61	77,736.74 €	- €	97.17 €	- €
62	77,833.91 €	- €	97.29 €	- €
63	77,931.21 €	- €	97.41 €	- €
64	78,028.62 €	- €	97.54 €	- €
65	78,126.16 €	- €	97.66 €	- €
66	78,223.81 €	- €	97.78 €	- €
67	78,321.59 €	- €	97.90 €	- €
68	78,419.50 €	- €	98.02 €	- €
69	78,517.52 €	- €	98.15 €	- €
70	78,615.67 €	412.64 €	98.27 €	510.91 €
240	510.27 €	510.27 €	0.64 €	510.91 €
Total	**0.00 €**	**100,878.92 €**	**16,318.47 €**	**116,318.47 €**

Source: own calculations

Variant II

The second analysed variant is the repayment plan when 9 monthly loan repayments are postponed after the end of 5 years of repayment (after 60 monthly loan repayments), while the repayment plan will be extended by 9 months. We present the results of the calculations in

table 2. From the table we can see that the first 69 loan repayments are the same as in the variant I. The difference can be observed in amount of annuity in the 70th loan repayment. New total loan repayment was set in value 488.00 EUR, while 180 periods were calculated (n*m was equal to 240-60), while the debt represented the amount as in variant I, the amount of 78,615.67 EUR. In this second variant, the farm would pay back to the bank the total amount **116,792.95 EUR** (60*482.55 + 180*488.00). After deducting the original debt in the amount of 100,000.00 EUR and the overpaid interest in the basic variant in the amount of 15,810.04 EUR, the farm overpaid a total of **982.05 EUR** more.

Table 2 Calculation results in variant II

Order of loan repayment	Loan balance at the beginning of the period	Principal loan repayment	Interest paid	Total loan repayment (annuity)
1	100,000.00 €	357.55 €	125.00 €	482.55 €
60	78,121.64 €	384.89 €	97.65 €	482.55 €
61	77,736.74 €	- €	97.17 €	- €
69	78,517.52 €	- €	98.15 €	- €
70	78,615.67 €	389.73 €	98.27 €	488.00 €
249	487.39 €	487.39 €	0.61 €	488.00 €
Total	**0.00 €**	**100,878.92 €**	**16,792.95 €**	**116,792.95 €**

Source: own calculations

Variant III

The third analysed variant is like the first variant, but the repayment plan with a postponement of 9 monthly total loan repayments will be implemented after the end of 15 years of repayment (that is, after 180 monthly loan repayments), while the repayment plan will not be extended by the given 9 months. We present the results of our calculations in table 3. The first 180 loan repayments were the same as in the basic variant, while the loan balance after 180 realized loan repayments was 27,876.86 EUR. After that, the deferment of loan repayments was implemented, while no interest was paid. The borrower's obligation (debt) was again automatically increased by unpaid interest. This was repeated nine times. At the beginning of the 190th loan repayment (after the end of the deferral), the debt increased to the amount of 28,192.05 EUR. Subsequently, we calculated the new amount of the total loan repayment according to formula (1), while 51 loan repayments were expected until the end of the period (240-189). The new amount of the annuity repayment was calculated at 570.94 EUR. In this third variant, the borrower paid a total of **115,976.01 EUR** (180*482.55 + 51*570.94). After deducting the original debt in the amount of 100,000.00 EUR and the overpaid interest in the basic variant in the amount of 15,810.04 EUR, the farm overpaid a total of **165.11 EUR** more.

Table 3 Calculation results in variant III

Order of loan repayment	Loan balance at the beginning of the period	Principal loan repayment	Interest paid	Total loan repayment (annuity)
1	100,000.00 €	357.55 €	125.00 €	482.55 €
180	28,324.01 €	447.14 €	35.41 €	482.55 €
181	27,876.86 €	- €	34.85 €	- €
182	27,911.71 €	- €	34.89 €	- €
183	27,946.60 €	- €	34.93 €	- €
184	27,981.53 €	- €	34.98 €	- €
185	28,016.51 €	- €	35.02 €	- €
186	28,051.53 €	- €	35.06 €	- €
187	28,086.60 €	- €	35.11 €	- €
188	28,121.70 €	- €	35.15 €	- €
189	28,156.86 €	- €	35.20 €	- €
190	28,192.05 €	535.70 €	35.24 €	570.94 €
240	570.23 €	570.23 €	0.71 €	570.94 €
Total	**0.00 €**	**100,315.19 €**	**15,976.01 €**	**115,976.01 €**

Source: own calculations

Variant IV

The last analysed variant is the repayment plan when 9 monthly loan repayments are postponed after the end of 15 years of repayment (after 180 monthly loan repayments), while the repayment plan is extended by 9 months. We present the results of the calculations in table 4.

Table 4 Calculation results in variant IV

Order of loan repayment	Loan balance at the beginning of the period	Principal loan repayment	Interest paid	Total loan repayment (annuity)
1	100,000.00 €	357.55 €	125.00 €	482.55 €
180	28,324.01 €	447.14 €	35.41 €	482.55 €
181	27,876.86 €	- €	34.85 €	- €
189	28,156.86 €	- €	35.20 €	- €
190	28,192.05 €	452.76 €	35.24 €	488.00 €
249	487.39 €	487.39 €	0.61 €	488.00 €
Total	**0.00 €**	**100,315.19 €**	**16,138.25 €**	**116,138.25 €**

Source: own calculations

From the table we can observe that the first 189 loan repayments are the same as in variant III. The difference can observe until the 190th loan repayment, where the new annuity was recalculated and it was set at a value of 488.00 EUR, while 60 periods were used (n*m was equal to 240-180). This amount turned out to be the same as in variant II, where 180 periods were missing before repayment. In this last variant, the farm would pay back to the bank a total

of **116,138.25 EUR** (180*482.55 + 60*488.00). After deducting the original debt in the amount of 100,000.00 EUR and the overpaid interest in the basic variant in the amount of 15,810.04 EUR, the borrower overpaid a total of **327.35 EUR** more.

Comparison of all variants

The comparison of the amount of overpaid interest compared to the basic model is presented in table 5. From the comparison of the variants follows that the most will be overpaid in interest in the second variant. It means that for the deferral of loan repayments was requested earlier, when the larger part of the loan had not yet been repaid and at the same time the loan repayment period was extended by the length of the deferral. The most advantageous variant turned out to be variant III, in which the postponement of loan repayments was requested after 15 years of repayment, i.e. when 75% of the repayment period had passed and at the same time the loan repayment period was not extended.

Table 5 Comparison of the total amount of overpaid interest in all 4 variants

Variants	The amount of overpaid interest	Order
Basic model	15,810.90 €	X
Variant I	16,318.47 €	3
Variant II	16,792.95 €	4
Variant III	15,976.01 €	1
Variant IV	16,138.25 €	2

Source: own calculations

The amount of interest overpaid compared to the basic model can be seen in graph 1 in individual variants, too.
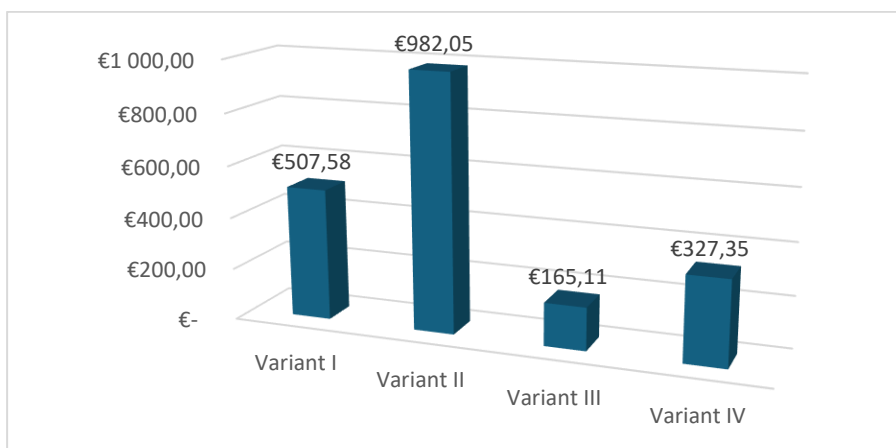
Graph 1 The amount of overpaid interest in individual variants compared to the basic model
Source: Table 5

CONCLUSIONS

In generally there are two types of loan repayment plans, namely with the same principal payments and wit the same total payments. We used the repayment plan with the same total payment on the monthly base (annuity repayment). For this type of repayment plan is typical an increasing principal payment with the decreasing interest payment, but the size of the total loan payment is the same over the life of the loan. The paper evaluated effects of the COVID-19 pandemic on the paid loan interest of farms in case of loan repayment deferrals at theoretical level using of 4 variants. The results show that the most unfavourable deferment of loan repayments was for farms that were at the beginning of repaying their loans and at the same time requested an extension of the loan maturity period. Higher interest reduces profit of these farms and also reduces their efficiency. Our recommendation for practice is that farms should use deferment of loan repayments only in necessary cases, as each deferment of loan repayments means an increase in interest costs.

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