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DEBT RESTRUCTURING MODEL: FROM COMMERCIAL CREDIT TO NON-PAYMENT OF DEBT

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ABSTRACT

In commercial transactions of goods and services, it is often required to extend credit to finance buyers who cannot pay in cash. Commercial credit transactions benefit both the buyer and seller. The seller increases sales because credit makes it possible to sell to buyers who do not have the cash for full payment of the commercial transaction. For buyers it becomes possible to acquire goods and services that would otherwise not be available to them. However, often an undesirable condition occurs when the debtor is in default of payment, usually because of insolvency or loss of liquidity for long periods. In these cases the most common solution is to restructure the debt, by establishing new payment commitments, feasible for the debtor. The aim of this paper is to propose a model for restructuring credit, based on equivalent equations.

***Keywords**: Equivalent equation, restructuring debt, promissory notes, loan, debtor, creditor.*

***AMS:** 97M30, 97D40.*

***JEL:** C69, M21.*

1. INTRODUCTION

In periods of economic crisis, companies and people need to refinance their debt in a situation of less income and more expenses. Despite, during crisis the granting of loans are lower, but there is always a possibility to reconfigure and renegotiate new loans.

It is common for people and companies to require commercial loansin order to buy goods or services. It basically consists in offering credit from a product supplier. In this scheme, different promissory notes with their respective due dates and amounts are signed.

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But, when financial resources of the debtor are not enough to pay one of these promissory notes there are several mechanisms that may be employed to address this situation, like to sale the asset, refinance debt or restructuring it. What is clear is that debtors must take a decision with strong fundamentals in order to avoid falling back into the lack of liquidity to meet its commitments.

A viable alternative is the restructuring of debt, either in the short or medium term, and also the debtor could gain precious time to recover their liquidity and most importantly of course, to pay off creditors.

To perform a debt restructuring, an agreement must be reached between debtor and creditor, but to do this, it is necessary to stipulate discount rates, interest rates, payment dates for each of the promissory notes. Therefore, in this paper a model with equivalent equations is proposed. The purpose is to establish a practical methodology to identify a factor to calculate the new scheme of debt, and also to integrate the variables: time, rates, coefficients, values of the original scheme and the values of the new scheme.

2. LITERATURE REVIEW

Clearly there will proposals that are not exactly attractive for everybody; that is why it could be convenient to consider a proposal as Pastor (1999) points. This proposal should be equitable for both, i.e. creditors and debtors should be satisfied with the financial operation of the renegotiation.

To make it possible, in parallel to the acquisition of the debt by the financing granted, the debtor starts a savings scheme that allows him to have a contingency fund to support financial commitments.

There are some theoretical proposals to get this, such as savings funds (García-Santillán Moreno, Saco-Baschkir, and Ramos, 2015) through schemes of annuities with geometric and arithmetic gradients, even in form of annuities simple by floating rate (García-Santillán, Gutierrez, Cristobal, and Catalayud, 2015) or ordinary annuities with gradient series (García-Santillán, Escalera, Venegas, 2014).

About the topic of renegotiation or restructuring the debt, there are some interesting proposals, like to restructure similar payments or payments with multiple amounts, all in rescheduled dates (Moreno, García-Santillán, Bermudez and Almeida, 2015). In this approach, the debt restructuring is carried out following a methodology that incorporates in a first term: the evaluation of the original debt, the new scheme of payments and the amount of each of the rescheduled payments, as referred García-Santillán, Venegas and Escalera (2014).

We remember that one of the purposes of the equivalent equations model is that debtors and creditors may obtain benefits with debt restructuring. Creditors obtain an economic benefit with the extension of deadline and debtor gains time. With this transaction, debtor can improve his resources management to meet their commitments.

If the debtor pays before deadline their commitments, it is fair to get a cost savings through the financial discount, even if the creditor fails to earn some cash; it is also true that retrieves the borrowed capital.

In order to renegotiate debt, firstly we have to apply a formula that allows us to know the amount of each payment Y ($_{formula\ 3}$) (depending on number of agreed payments), for this, first we need to assess the original debt ($O_{DV,\ formula\ 1}$), to calculate the new payment scheme for obtaining the coefficient ($N_{SD,\ formula\ 2}$) and to know the dates of the new payment scheme.

$$O_{DV}=\sum_{n=1}^{bff}Pn_{1bfd}\left[1+\left(\frac{i_nt_n}{a}\right)\right]^{t/m}+......Pn_{j_{bfd}}\left[1+\left(\frac{i_nt_n}{a}\right)\right]^{t/m}+Pn_{fd}+\sum_{n=1}^{ff}\frac{Pn_{1afd}}{\left[1+\left(\frac{i_nt_n}{a}\right)\right]^{t/m}}+......\frac{Pn_{j_{afd}}}{\left[1+\left(\frac{i_nt_n}{a}\right)\right]^{t/m}} \tag{1}$$

$$N_{SD}=\sum_{1=j}^{bfd}Sn_{bfd}\left[1+\left(\frac{i_nt_n}{a}\right)\right]^{\frac{t}{m}}+S_{fd}+\sum_{1=j}^{afd}\frac{Sn_{afd}}{\left[1+\left(\frac{i_nt_n}{a}\right)\right]^{\frac{t}{m}}} \tag{2}$$

$$Y=\frac{O_{DV}}{N_{SD}} \tag{3}$$

Theory says that equivalent equations model seeks the equity between stakeholders (debtor and creditor) therefore, it is important to define -from the beginning-, the focal date. At this date, all calculations are centered; the original value of the debt (due and overdue or about to expire) and the proposed new payments, this last, in reference to the new dates.

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Therefore, and taking as theoretical reference the equivalent equations theorem, the methodological design is presented below.

3. METHODOLOGY

Following the work of; García-Santillán, Venegas and Escalera, (2014), Moreno, García-Santillán, Bermúdez and Almeida, (2015) whose proposals were founded in the work of Pastor (1999), we proceed to establish the following methodology for renegotiation:

1. Determine a date for placing all overdue promissory notes and not yet due, and this is called focal date.
2. Valuing debt to the focal date, using the formula of the value of the original scheme.
3. Get the coefficient of the new payment scheme, which is calculated from the number of restructured payments or new payments.
4. Calculate the value of each payment from an algebraic division between: the result of the total original debt and the coefficient of the new payment scheme.
5. Finally, determine the amount of each payment renegotiated, even equals payments or payments in different amounts.

Supposing that

Debtor´s cash flow doesn´t allow him to pay on maturity each promissory note, because he doesn´t have enough economic resources to meet its commitments. This is the right moment in which debtor should contact his creditor in order to propose renegotiate the debt, i.e. to restructure the liabilities by a new scheme. Then, dates and amounts shall be adjusted to give way to a new payment scheme. Thus, the mathematical model is expressed in three main formulas as follows:

First formula:

The Original Debt Value (O_{DV}) with exact compounded interest is as follow:

$$O_{DV}=\sum_{n=1}^{bff}Pn_{1bfd}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}+......Pn_{j_{bfd}}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}+Pn_{fd}+\sum_{n=1}^{ff}\frac{Pn_{1afd}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}}+......\frac{Pn_{j\,afd}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}}$$

Where:

O_{DV} = Value of debt (valuated);

$\sum_{n=1}^{bff}Pn_{1bfd}......Pn_{j_{bfd}}$ = Sum of all Promissory notes before focal date, from 1 to *j;*

Pn_{fd} = Promissory notes in focal date;

$\sum_{1=n}^{afd}Pn_{1afd}+......Pn_{j\,afd}$ = Sum of all Promissory notes after focal date, from 1 to *j;*

$\left[1+\left(\frac{i_j t_j}{a}\right)\right]$ = factor indexation or discount;

$i=$ Interest rate;

$t/m=$ Time and capitalization;

a = 360 days of ordinary year or 365 days of exact year

Second formula:

The New Scheme (N_{SD}) with exact compounded interest is as follow:

$$N_{SD}=\sum_{1=j}^{bfd}Sn_{bfd}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}}+S_{fd}+\sum_{1=j}^{afd}\frac{Sn_{afd}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}}}$$

If we become S_n = X to get all coefficients, so we have:

$$N_{SD} = \underbrace{\sum_{1=j}^{bfd} Xn_{bfd}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}}}_{\text{Coefficient before focal date}} + \overbrace{X_{fd}}^{\text{Coefficient of focal date}} + \underbrace{\sum_{1=j}^{afd} \frac{Xn_{afd}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}}}}_{\text{Coefficient after focal date}}$$

To reduce the expression of the mathematical model, we say:

$$\sum_{1=j}^{bfd} Xn_{bfd}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}} = C_{bfd} \quad ; \quad X_{fd} = C_{fd} \text{ And } \quad \sum_{1=j}^{afd} \frac{Xn_{afd}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}}} = C_{afd}$$

Then to distinguish the coefficients C, we can say that before the focal date is C_{bfd}, in the focal date C_{fd} and after the focal date C_{afd}.

Therefore we have:

$$N_{SD} = Y\left(\sum_{1=j}^{bfd} C_{bfd} + C_{fd} + \sum_{1=j}^{afd} C_{afd}\right)$$

Thus:

Third formula is

$$Y = \frac{O_{DV}}{\left(\sum_{1=j}^{bfd} C_{bfd} + C_{fd} + \sum_{1=j}^{afd} C_{afd}\right)}$$

Where:

Y = the value of each payment;

O_{DV} = Value of debt (valuated);

$\sum_{1=j}^{bfd} C_{bfd}$ = Sum of the coefficients before focal date;

C_{fd} = Coefficient focal date;

$\sum_{1=j}^{afd} C_{afd}$ = Sum of the coefficientsafter focal date

Nominal exchange rate 12%, with *t/27*

6. EQUIVALENT EQUATION MODELING

Under the supposition that the following amounts should be paid at the following dates (table 1) we develop the next case, in order to debt valuation in a restructuring debt.

Table-1: Data to solve the case (original debt)

Promissory note	Due date (expired or maturity)	i_d = Accurate Interest rate (to discount)	Amount (Thousands of dls.)
Pn1	Expired 171 days ago (*bfd*)	$(\sum i_{indx}/365*m)$	\$100.00
Pn2	Expired 163 days ago(*bfd*)	$(\sum i_{indx}/365*m)$	\$120.00
Pn3	Expired 78 days ago(*bfd*)	$(\sum i_{indx}/365*m)$	\$115.00
Pn4	Expired 35 days ago(*bfd*)	$(\sum i_{indx}/365*m)$	\$90.00
Pn5	Expired in focal date (*fd*)	*Without interest rate*	\$71.50
Pn6	maturity of 31 days (*afd*)	$(\sum i_d/365m$	\$111.00
Pn7	maturity of 67 days(*afd*)	$(\sum i_d/365*m)$	\$123.00
Pn8	maturity of 81 days(*afd*)	$(\sum i_d/365*m)$	\$200.00
Pn9	maturity of 131 days(*afd*)	$(\sum i_d/365*m)$	\$300.00
Pn10	maturity of 171 days(*afd*)	$(\sum i_d/365*m)$	\$190.00

Source: Own.

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The first step is to transform the nominal interest rate to effective interest rate

$$Te = \left[\left(1+\frac{i}{m}\right)^{n} - 1\right]*100 \quad Te = \left[\left(1+\frac{0.12}{365}*27\right)^{365/27} - 1\right]*100$$

$$Te = \left[(1+0.008876)^{13.518518} - 1\right]*100 = 12.6889\%$$

After this, we proceed to calculate O_{DV} through the next formula

$$O_{DV} = \sum_{1=j}^{bff} Pn_{1bfd}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m} + ...Pn_{j_{bfd}}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m} + Pn_{fd} + \sum_{1=j}^{ff}\frac{Pn_{1afd}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}} + ...\frac{Pn_{j_{afd}}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}}$$

$$O_{DV} = \sum_{1=j}^{bff} Pn_{1_{bfd}}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m} + Pn_{2_{bfd}}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m} + Pn_{3_{bfd}}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m} + Pn_{4_{bfd}}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m} + ...$$

$$... + Pn_{5\,fd} + \sum_{1=j}^{ff}\frac{Pn_{6_{afd}}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}} + \frac{Pn_{7_{afd}}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}} + \frac{Pn_{8_{afd}}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}} + \frac{Pn_{9_{afd}}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}} + \frac{Pn_{10_{afd}}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{t/m}}$$

$$O_{DV} = \sum_{1=j}^{bff} \$100\left[1+\left(\frac{0.126889}{365}*27\right)\right]^{171/27} + \$120\left[1+\left(\frac{0.126889}{365}*27\right)\right]^{163/27} + \$115\left[1+\left(\frac{0.126889}{365}*27\right)\right]^{78/27} + ...$$

$$... + \$90\left[1+\left(\frac{0.126889}{365}*27\right)\right]^{35/27} + \$71.50 + \sum_{n=1}^{ff}\frac{\$111|}{\left[1+\left(\frac{0.126889}{365}*27\right)\right]^{31/27}} + \frac{\$123}{\left[1+\left(\frac{0.126889}{365}*27\right)\right]^{67/27}} + ...$$

$$... + \frac{\$200}{\left[1+\frac{0.126889}{365}*27\right]^{81/27}} + \frac{\$300}{\left[1+\left(\frac{0.126889}{365}*27\right)\right]^{131/27}} + \frac{\$190}{\left[1+\left(\frac{0.126889}{365}*27\right)\right]^{171/27}}$$

$$O_{DV} = \$106.09 + \$126.96 + \$118.14 + \$91.09 + \$71.50 + ...$$
$$... + \$110.16 + \$121.01 + \$196.11 + \$290.63 + \$182.29$$

$$O_{DV} = \$1,414.05$$

Now we proceed to calculate N_{SV} with the next data:

Table-2: Data to solve the case (New scheme debt)

Promissory note	Due date (expired or maturity)	i_d = Accurate Interest rate (to discount)	Y
Pn1	maturity of 30 days (*afd*)	($\sum i_d/365*m$)	Unknown
Pn2	maturity of 60 days (*afd*)	($\sum i_d/365*m$)	Unknown
Pn3	maturity of 90 days (*afd*)	($\sum i_d/365*m$)	Unknown
Pn4	maturity of 120 days (*afd*)	($\sum i_d/365*m$)	Unknown
Pn5	maturity of 150 days (*afd*)	*Without interest rate*	Unknown
Pn6	maturity of 180 days (*afd*)	($\sum i_d/365*m$)	Unknown
Pn7	maturity of 210 days (*afd*)	($\sum i_d/365*m$)	Unknown
Pn8	maturity of 240 days (*afd*)	($\sum i_d/365*m$)	Unknown

Source: Own

With previous data described in table 2, we proceed to calculate N_{SV} through the original formula:

$$N_{SD} = \sum_{1=j}^{bfd} Xn_{bfd}\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}} + X_{fd} + \sum_{1=j}^{afd}\frac{Xn_{afd}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}}}$$

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Therefore, to do this we use:

$$N_{SD} = \sum_{1=j}^{afd} \frac{Xn_{afd}}{\left[1+\left(\frac{i_n t_n}{a}\right)\right]^{\frac{t}{m}}}$$

$$N_{SD} = \sum_{1=j}^{afd} \frac{X_{1afd}}{\left[1+\frac{0.126889}{365}*27\right]^{\frac{30}{27}}} + \frac{X_{2afd}}{\left[1+\frac{0.126889}{365}*27\right]^{60/27}} + \frac{X_{3afd}}{\left[1+\frac{0.126889}{365}*27\right]^{90/27}} + \dots$$

$$\dots + \frac{X_{4afd}}{\left[1+\frac{0.126889}{365}*27\right]^{120/27}} + \frac{X_{5afd}}{\left[1+\frac{0.126889}{365}*27\right]^{150/27}} + \frac{X_{6afd}}{\left[1+\frac{0.126889}{365}*27\right]^{180/27}} + \dots$$

$$\dots + \frac{X_{7afd}}{\left[1+\frac{0.126889}{365}*27\right]^{210/27}} + \frac{X_{8afd}}{\left[1+\frac{0.126889}{365}*27\right]^{240/27}}$$

If we change X by 1 in all cases:

$$N_{SD} = \sum_{1=j}^{afd} \frac{1_{1afd}}{[1.010434]} + \frac{1_{2afd}}{[1.020978]} + \frac{1_{3afd}}{[1.031631]} + \frac{1_{4afd}}{[1.042396]} + \frac{1_{5afd}}{[1.053273]} + \frac{1_{6afd}}{[1.064264]} + \dots$$

$$\dots + \frac{1_{7afd}}{[1.075369]} + \frac{1_{8afd}}{[1.086590]}$$

$$N_{SD} = (0.989673 + 0.979452 + 0.969338 + 0.959327 + 0.949421 + 0.939616 + 0.929913 + 0.920309)$$

$$N_{SV} = (7.63705246)$$

To calculate Y (equal payments)

$$Y = {O_{DV}}/{N_{SV}} \quad Y = {\$1,414.005}/{7.63705246} \quad Y = \$185.15$$

The result obtained to eight equal payments is $185.15

DISCUSSION AND CONCLUSION

To use equivalent equations to restructure a debt is a scheme that has advantages in the assumption that the debtor cannot fulfill its commitments. In their seminal works García-Santillán, Venegas-Martínez and Escalera-Chavez (2014), have suggested several proposals in order to restructuring debt: with equal payments, different amounts and dates, among others.

They identified a common factor based on the valuation of original debts and the new proposal scheduled payments dates, which allows establishing a parameter in the timeline, which also seek a balance between the overdue and not yet overdue promissory notes, benefiting both, debtor and creditor.

Finally, we note that although this model is not the only means to renegotiate debt, at least it is a scheme which seeks to establish a mutual balance between debtors and creditors.

This method is a proposal to use for debt restructuring. From the original debt based on the focal date, we can calculate a new scheme of payments to agree with the creditor, as well as new payment dates. With this, people or companies reduce probability of becoming legal instances.

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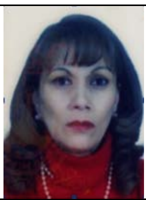

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