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A Model to Manage Debt through Equivalent Equations

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ABSTRACT
Companies often face conditions of illiquidity, which leads them to positions of default with creditors and suppliers. This leads to the need for debtors to restructure the debt with its creditors. This article presents a proposal for debt restructuring in a hypothetical scenario by applying equivalent equations. The results show that, under the new payment scheme, the creditor will receive an added profit, and the debtor will get more time to pay, allowing him for better cash flow and working capital management, and for generating best indicators of solvency and liquidity.

Introduction

Often, companies must face conditions of lack of cash to meet its commitments to creditors, whether their suppliers of goods or financial institutions. This, beyond being a problem putting the operations of the company at risk, should be taken as an occasion for conducting financial business re-engineering.

The current economic condition of Mexico, has caused uncertainty to the purchase-sale of products and services, as has been pointed out by Moreno-Garcia, García-Santillán, Bermudez and Almeida (2015); then this phenomenon has brought a significant drop in sales, so impacting the cash flow of the companies.

This circumstance is of paramount importance, because the collection management becomes more difficult, and it often ends with the nonpayment of debts to suppliers and creditors.

When a company takes a capital credit from a financial institution, or receives financing from its suppliers -for acquiring inputs or raw materials necessary for its operations- it is customary to sign promissory notes with maturities of specific dates. Sometimes a contract establishes the sequence of payments by defining an amortization where payment deadlines are scheduled.

From the above, we envision a hypothetical scenario of a company that, when reviewing its cash flows, realizes that several promissory notes cannot be settled on the agreed dates and amounts.

In the hypothetical scenario, by mid-2016, the company analyzed its estimated cash flows for 2017 and found that it will not have enough financial resources available to fulfill on time with several of its credit obligations. Then the question arises: what economic strategy is suitable to address the possible debt default?

From that question, and after the ideas of García-Santillán and Vega-Lebrúm (2008), and García-Santillán, Venegas-Martinez and Escalera-Chavez (2014), this article proposes a hypothetical model for debt restructuring, where the payment dates can be re-scheduled before an established focal date.

The resulting restructuring is conditional upon acceptance by the creditor who must carry out risk analysis of the proposal. Although such risk analysis is beyond the scope of this paper, worth noticing that the creditor can see in principle the benefits in recovering the feasibility of payment by the debtor, and having in his favor the possibility of receiving extra payment in compensation for waiting.

Literature review

The subject of credit or financing, is definitely a concern to those who have requested this kind of support due to lack of resources, and for those who grant this support, there is also a possibility of lack of payment or non-compliance from the debtors, which would bring a financial imbalance as they are not being able to recover their resources. Hence, the subject of the debt becomes a variable that can be explained in this document.

The debt is defined as the link granted between two sides, the debtor and the creditor, since both are linked to each other because of a purchase-sale operation on credit. The debtor undertakes to settle the creditor to the economic benefit object of the obligation (García-Santillán et al, 2008).

In the works of Moreno-Garcia, García-Santillán, Bermudez and Almeida (2015), the indebtedness is a strategy recommended to support the operation of the company. They furthermore recommend taking into account several variables such as: the financial situation of the company, the profit and parallel margins of the company, the interest rate prevailing at the time of hiring debt, among other factors.

It is important that the debtor Company is able to monitor its cash flows, in order to avoid non-payment of the contracted debts to the creditors. Additionally, in case of a possible non-payment condition, it is also important to have an alternative for allowing an agreement with the creditor for

restructuring the debt, modifying payment dates and even the amounts, to different payment dates with new amounts.

As part of the grounds on which the proposal is based, worth pointing out some data published by the *Comisión Nacional Bancaria y de Valores* (CNBV, 2015) regarding specific information of NPLs in the financial sector, most notably the multiple banks (and other financial institutions).

In this regard, the total credit portfolio is divided into two large groups: current portfolio, integrated by the current credits and their payments; and the overdue portfolio, where the borrowers are declared for bankruptcy, or, whose main interest, or both, have not been liquidated on the original agreed terms.

The credit portfolio is composed of three large segments; financial consumption, commerce, and housing. Out of these, the one showing the biggest rise in NPLs for the period mentioned is commercial credit, with 42.5%, followed by consumer credit, with 37.5%, and housing increased its NPLs by 12.7% (data update to 2014). Loans to commercial activities showed the highest NPLs. It is clear that there is a problem with the economy, not only because they stopped paying loans, but also because the financial activity comes from them (CNBV, 2015).

Derived from this, recently the Chamber of Representatives approved the financial reform, providing changes that would allow people owing to private Banks, whom are not fulfilling their acquired obligations, to be held and subject to face two years of prison. Although the federal government and the legislators have talked about multiple benefits for the users of the financial services with this reform, for instance, an eventual decrease in the interest rates, as well as flexibility on the requirements to earn a credit. The reform also brings along a benefit for the Mexican banking, by establishing mechanisms that allow charging more efficiently.

Among these changes, there is a possibility for the debtors to be held and forced to remain in a single place in order to face a mercantile trial and, in case of breaking the hold, they may be sent to prison, while, up to now, you cannot be charged for civil debts. Meaning, the debtor must stay in a permanent residence where the trial is to take place, without the possibility of leaving town.

In case the person leaves the town where the trial is taking place, without having a legal representative speak for him, the reform contemplates he will be punished under the Penal Code regarding "disobedience to a legitimate mandate of public authority".

The Federal Penal Code, Chapter VI dedicated to Crimes against -Article 178- Authority states, "Whoever disobeys the mandate of house arrest or ban on leaving a geographical demarcation issued by a competent judicial authority, he imposed six months to two years in prison and 10 to 200 days' fine."

This measure contradicts the Constitution, which in the last paragraph of Article 17 states: "No one can be imprisoned for debts of a purely civil character." The explanatory memorandum states that this reform to expand the sources of funding is necessary to ensure legal certainty for banks in lending, in anticipation of an eventual default and recovery of property left as a guarantee. *"Especially for creditors to recover resources more easily in the event of default by the debtor and particularly in those cases where a guarantee exists,"* it stated.

In addition to this, Gonzalez (2015) explains that collection firms can buy nonperforming loans from any financial institution, but these do not follow these

new measures. When the firms acquire a debt from a bank, debtors no longer keep any relationship with the financial institution, this the reform measures are invalidated. With these arguments as concerns, the question arises: what to do when not having the financial resources to pay debts?

Methodology

Based on the above, now a financial model with equivalent equations is developed following the methodology proposed by García-Santillán et al (2014). For this, the hypothetical case of a company that wishes to make a debt restructuring, derived from pre flows projected for the year 2017 cash analysis, being the month of July 2016 when the decision is made to design the restructuring proposal.

Assuming that a year before the focal date, an agreement for debt restructuring is done with all promissory notes not be settled on the dates and amounts with which were unsigned by other payment dates and amounts, all before a prearranged focal date (see table 2).

A tentative focal date is established as for the debt restructuring, 15 July 2017. It is also agreed to liquidate the debt revalued in five equal payments, reclassifying the dates of the original promissory notes and the update and discount rates, all this, according to the following information:

Cash flow projected for 2017 is as follows:

Table 1. First half 2017 (thousands of dollars)

Item	Jan	Feb	Mar	Apr	May	Jun
Opening/previous balance	$0.00	-$24.90	$0.97	$26.26	$51.55	$77.42
Origin of the funds						
Total taxable sales	$52.50	$42.50	$42.00	$42.00	$42.50	$42.50
Total sales untaxed	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
VAT transferred	$8.40	$6.80	$6.72	$6.72	$6.80	$6.80
Total available funds	$60.90	$24.40	$49.69	$74.98	$100.85	$126.72
Allocation of funds						
Operating expenses	$21.40	$21.30	$21.30	$21.30	$21.30	$21.30
Total sales	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Investments	$53.67	$0.00	$0.00	$0.00	$0.00	$0.00
Creditable VAT	$10.73	$2.13	$2.13	$2.13	$2.13	$2.13
Total allocation of funds	$85.80	$23.43	$23.43	$23.43	$23.43	$23.43
Difference	-$24.90	$0.97	$26.26	$51.55	$77.42	$103.29

Table 1a. Second half 2017 (thousands of dollars)

Item	Jul	Ago	Sept	Oct	Nov	Dec
Opening/previous balance	$103.29	$129.16	$155.03	$180.90	$206.77	$232.64
Origin of the funds						
Total taxable sales	$42.50	$42.50	$42.50	$42.50	$42.50	$52.00
Total sales untaxed	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
VAT transferred	$6.80	$6.80	$6.80	$6.80	$6.80	$8.32
Total available funds	$152.59	$178.46	$204.33	$230.20	$256.07	$292.96
Allocation of funds						
Operating expenses	$21.30	$21.30	$21.30	$21.30	$21.30	$21.30
Total sales	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Investments	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Creditable VAT	$2.13	$2.13	$2.13	$2.13	$2.13	$2.13
Total allocation of funds	$23.43	$23.43	$23.43	$23.43	$23.43	$23.43
Difference	$129.16	$155.03	$180.90	$206.77	$232.64	$269.53

Source: own

The data of the original debt restructuring are sought are as follows:

Table 2. Value of the original schedule (O_{vs})

Promissory Notes (PN)	Overdue and non-overdue	Date	Days	Amount
1	bfd*	2017-03-15	75	$25.87
2	bfd*	2017-04-15	60	$25.29
3	bfd*	2017-05-15	45	$25.29
4	bfd*	2017-06-15	30	$25.87
5	fd**	15/7/2017	ff	$25.87

*bfd: before focal date   **fd: at focal date

Source: own

Original timeline
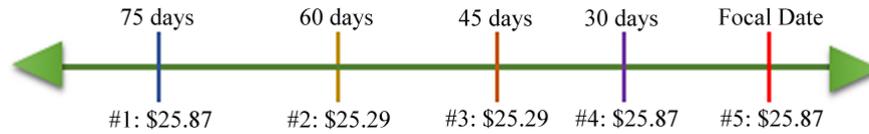
New payment schedule

The new payments would be on the following dates and amounts:

1	2017-05-15	51 bfd*	Equal payments	12% every 28 days
2	2017-06-30	15 bfd*	Equal payments	12% every 28 days
3	2017-07-15	fd**	Equal payments	n.a.
4	2017-08-31	47 afd***	Equal payments	8% every 28 days
5	2017-11-30	138 afd***	Equal payments	8% every 28 days
bfd*: before focal date		fd**: at focal date	afd***: after focal date	

The timeline for the year 2017 is as follows:
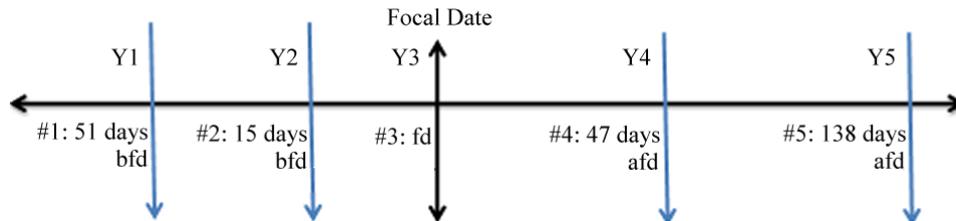
In order to calculate O_{VS}, we use for all overdue promissory notes $\sum PN_{bfd}$, the effective interest rate E_{ir} in form of capitalization, and for all unmatured notes $\sum PN_{afd}$, we also use R_{ir} in form of capitalization.

Thus we have

$$O_{VS} = \sum PN_{bfd}\left[1+\left(\frac{E_{ir}}{t}*m\right)\right]^{t/m} + PN_{fd} + \frac{\sum PN_{afd}}{\left[1+\left(\frac{R_{ir}}{t}*m\right)\right]^{t/m}}$$

Now, to compute the debt to the focal date set, we have:

$$O_{VS} = \sum PN_{1....4bfd}\left[1+\left(\frac{E_{ir}}{t}*m\right)\right]^{t/m} + PN_{fd}$$

$$O_{VS} = \sum \$25.87\left[1+\left(\frac{.12}{365}*28\right)\right]^{\frac{75}{28}} + \$25.29\left[1+\left(\frac{.12}{365}*28\right)\right]^{\frac{60}{28}} + ...$$

$$... + \$25.29\left[1+\left(\frac{.12}{365}*28\right)\right]^{\frac{45}{28}} + \$25.87\left[1+\left(\frac{.12}{365}*28\right)\right]^{\frac{30}{28}} + \$25.87$$

$$O_{VS} = \sum \$25.87\left[1+\left(0.00920548\right)\right]^{2.67857143} + \$25.29\left[1+\left(0.00920548\right)\right]^{2.14285714} + ...$$

$$... + \$25.29\left[1+\left(0.00920548\right)\right]^{1.60714286} + \$25.87\left[1+\left(0.00920548\right)\right]^{1.07142857} + \$25.87$$

$$O_{VS} = \sum \$25.87\left[1.02484844\right] + \$25.29\left[1.01982984\right] + ...$$

$$... + \$25.29\left[1.01483582\right] + \$25.87\left[1.00986625\right] + \$25.87$$

$$O_{VS} = \sum \$26.51 + \$25.79 + \$25.66 + \$26.13 + \$25.87$$

$$O_{VS} = \$129.96$$

Now to calculate the new payment scheme, we use:

$$N_{VS} = \sum 1_{bfd}\left[1+\left(\frac{E_{ir}}{t}*m\right)\right]^{t/m} + 1_{fd} + \frac{\sum 1_{afd}}{\left[1+\left(\frac{R_{ir}}{t}*m\right)\right]^{t/m}}$$

The value of the five payments are derived from:

$$O_{VS} = \sum PN_{1....2.bfd}\left[1+\left(\frac{E_{ir}}{t}*m\right)\right]^{t/m} + PN_{3...fd} + \frac{\sum PN_{4...5.afd}}{\left[1+\left(\frac{R_{ir}}{t}*m\right)\right]^{t/m}}$$

$$O_{VS} = 1_{1.bfd}\left[1+\left(\frac{.12}{365}*28\right)\right]^{51/28} + 1_{2.bfd}\left[1+\left(\frac{.12}{365}*28\right)\right]^{15/28} + 1_{3...fd} + ...$$

$$... + \frac{1_{4.afd}}{\left[1+\left(\frac{.08}{365}*28\right)\right]^{47/28}} + \frac{1_{5.afd}}{\left[1+\left(\frac{.08}{365}*28\right)\right]^{138/28}}$$

$$O_{VS} = 1_{1.bfd}\left[1+\left(0.00920548\right)\right]^{51/28} + 1_{2.bfd}\left[1+\left(0.00920548\right)\right]^{15/28} + 1_{3.fd} + ...$$

$$... + \frac{1_{4.afd}}{\left[1+\left(0.00613699\right)\right]^{47/28}} + \frac{1_{5.afd}}{\left[1+\left(0.00613699\right)\right]^{138/28}}$$

$$O_{VS} = 1_{1.bfd}\left[1.016921\right] + 1_{2.bfd}\left[1.00494732\right] + 1_{3.fd} + ...$$

$$... + \frac{1_{4.afd}}{\left[1.0132281\right]} + \frac{1_{5.afd}}{\left[1.0306134\right]}$$

$$O_{VS} = 1.016921 + 1.00494732 + 1 + ...$$

$$... + 0.98978266 + 0.97029594$$

Now, five equal payments $Y_{1....5}$ can be computed as:

$$Y = \frac{O_{vs}}{N_{vs}} \quad Y = \frac{\$129.96}{4.981946912} \quad Y = \$26.09$$

Finally, the payments should be cleared as show in the following schedule:

1	$26.09	15/05/2017
2	$26.09	30/06/2017
3	$26.09	15/07/2017
4	$26.09	31/08/2017
5	$26.09	30/11/2017

Conclusion

The proposal described in this document is intended to offer a solution for those debtors who, facing insufficient financial resources, might consider making a debt restructuring with its creditors to pay their debts. Therefore, both parties will get profit: the debtor postpones the payment date according to the dates on which he estimates will have the cash available to pay and, on the other hand, the creditor will receive more money in compensation for waiting.

Equivalent equations models seek to encourage both parties involved. First, the debtor who for any reason could not fulfill the obligation to cover all of its payments, and creditor, to recover the money given to the debtor as financing or credit (Pastor, 1999; García-Santillán, 2011, 2014).

Disclosure statement

No potential conflict of interest was reported by the authors.

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