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Felipe Bolio Rianchos, Fianzas Atlas S.A., Mexico

Are the methods currently used by the market still effective to assess the client/contractor's solvency? New tools for evaluating their risk rating

A conceptual approach to financial solvency analysis in the risk management context

Overview of the problem

In order to guarantee the bonded client's obligations, surety underwriters focus their analysis on the types of solvency; for example, in the Mexican market and its applicable legislation, three types of solvency are mainly taken into account: moral, technical and financial, from which only the financial solvency has quantitative characteristics. Thus the underwriting process has a completely parametric profile and does not include a qualitative analysis of technical and moral solvency. Therefore, the sureties' own policy indicators could leave out businesses that are important due to the characteristics of the sector the client belongs to, as currently occurs with bonding lines.

Moreover, if only the client's financial analysis is taken into account, the inherent bond underwriting risk within the surety itself is disregarded. This is a very important type of risk because it can have a severe aggregate effect on the surety and at the macroeconomic level as well. For this reason, Chilean legislation invites insurance companies to follow a systematic risk management process to consider not only the insurer's financial strength when underwriting a product but also the inherent risk. To this end, a risk matrix is used which, beyond reflecting the underwriting acceptance or rejection, provides risk parameters and individual indicators of the major characteristics of both the company and the insurance product.

Financial analysis development

First-order analysis: inadequate standard financial ratios

Standard financial ratios are one of the most common financial management tools used to evaluate the company's solvency and capacities since it is very useful to know the ratio of the company's assets to liabilities, the proportion of the company's equity that is allocated to debt repayment or the ability of the company to pay short-term obligations using its current assets. That is, they provide indicators of the relationship between two financial statement items or accounts on a numeric and concrete basis.

So, to analyze the principal's solvency, profitability ratios should be considered, for example, the gross profit margin, operating profit margin or net profit margin since they will show how the gross, operating or net income on sales is managed. In this general solvency analysis, it is also important to take into account the degree of leverage or the return on fixed and total assets or the return on equity from operating or net income.

In the surety sector, where the obligations of the various sublines are mainly classified into obligations to do, to give or pay, it is very easy to use financial ratios to establish the minimum ranges or parameters a client must have to prove its solvency, or else the minimum indicators to create a security interest that may support the issuance of a surety bond.

Therefore, it is advisable that the financial ratios related to the nature of the obligation play a part in the underwriter's acceptance or rejection of an issuance. That is, if the client to be bonded will assume an *obligation to do*, it is important to consider the financial ratios related to its operation and installed capacity, such as the fixed and total asset turnover.

However, in the case of a client that will assume an *obligation to give*, the financial ratios that are related to its inventories must be mainly considered, e.g., inventory turnover, average inventory cycle or even current asset turnover.

In the *obligation to pay*, where indebtedness and liquidity play a key role, the most important financial ratios clearly are the current ratio together with its acid test, the accounts receivable turnover and the debt ratio together with the degree of leverage.

Based on the above classification, it can mistakenly be assumed that the obligations involve some specific financial ratios and exclude others so that to a greater or lesser extent the evaluation specializes and considers the liquidity, activity, indebtedness or profitability. However, it is important to bear in mind that bonding of an obligation involves the study of its entire solvency, so the underwriting process should not exclude any of the financial ratios.

Second-order analysis: DuPont Method and Altman Z-score Analysis

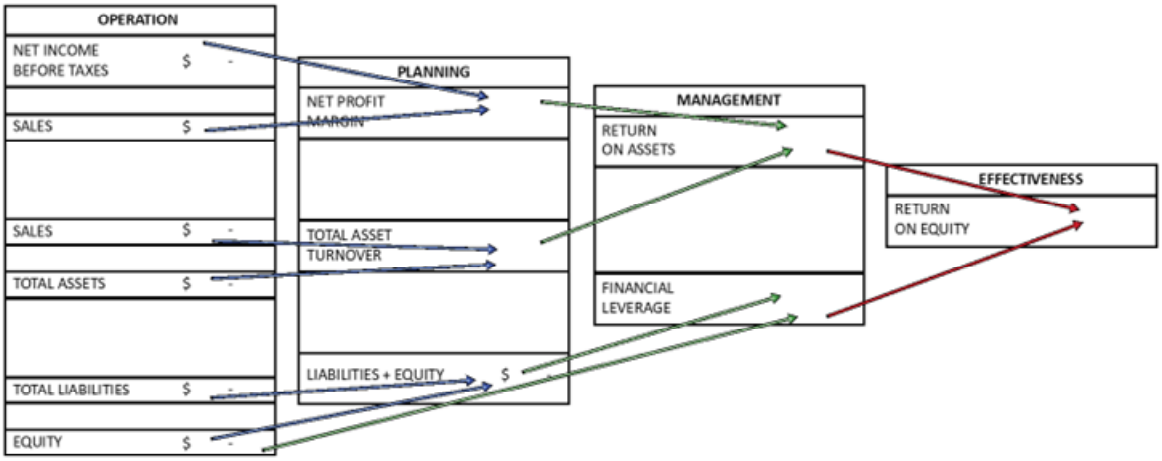
In order to integrate the aforementioned financial ratios into a single expression within the solvency study, two methods that meet this target have been considered: the DuPont Method and Altman Z-score Analysis. Both methods overcame a drawback any financier may encounter at the time of evaluating the solvency and arrive at a single indicator that includes the major financial ratios. The DuPont Method calculates the return on equity through a percentage and the Altman Z-score Analysis gauges solvency.

DuPont Method

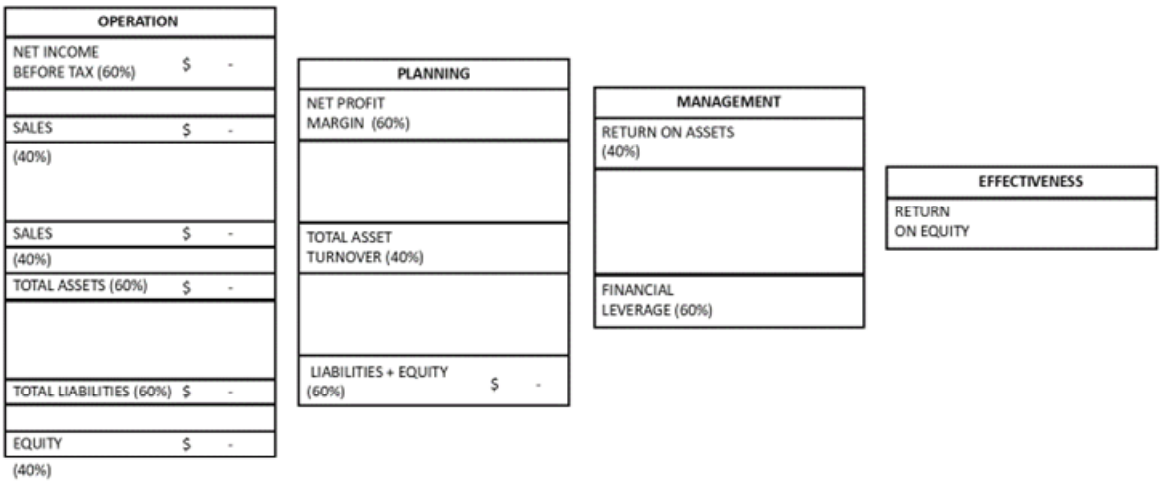
In the book *Estrategia Financiera,* Bernal García states that this method allows us to analyze one of the core elements of net profits or determine a mix of products with balanced turnover or profitability and study their trend to focus on those products that are more profitable or have a higher turnover.

One of the main advantages of this method is its simple application which, however, provides valuable information on what measures to implement in day-to-day management to improve the results. Yet, there is the limitation derived from greater or less reliability of the accounting data on which the study is based. In any case, this analysis is always complementary to other economic and financial indicators that may give a wider general view.

As shown below, if the accounts and financial ratios are organized in a sequential and process-based order, a branching diagram can be drawn. Thus, at each one of its level, complementary weights can be assigned to the preceding accounts or financial ratios, where the importance to be given to the dependent financial ratio increases or decreases.



In this way the DuPont Method can be adjusted according to the significance the underwriting institution attaches to the financial ratios within the obligation to be bonded. Please note that the complementarity concept implies that the sum of weights must be 100% in the preceding accounts of each dependent ratio, as is shown below *:



* 60/40 percentages are used for illustrative purposes only.

The weight ranges go from 90/10 to 60/40, the greater percentage being assigned to the financial ratio that is more closely related to the obligation, and 50/50 is used to indicate that the two accounts or ratios are of equal importance. In this specific method, the accounts and financial ratios that would be more closely related to the obligations to do, to give and pay are listed in the following table:

TO PAY	*TO DO*	*TO GIVE*

• Sales • Total liabilities • Financial leverage	• Income before taxes • Total assets • Equity • Asset turnover	• Total assets • Asset turnover • Return on assets

What is interesting about the DuPont Method is that it measures the return on equity effectiveness and, by cross-checking it with the established weights, it will generate a trend focused on the accounts and will increase or decrease the result of this method.

Altman Z-score Analysis

The Altman Z-score was initially designed to gauge a publicly traded manufacturing company's probability of insolvency. It is such an adaptable method that adjustments were made to use it for non-publicly traded manufacturing companies and, then, for gauging any company's insolvency.

This method consists of 4 or 5 ratios, depending on the sector, which are multiplied by a factor according to their correlation with the probability of insolvency. Thus, the ratios are summed to calculate an indicator that is divided into three categories: high probability of insolvency, completely solvent, and an uncertainty range in which the trend toward one end or the other will depend on the financial control exercised.

The ratios are as follows:

• X1, Working capital/total assets: This ratio measures the relative liquidity of the company.
• X2, Retained earnings/total assets: Retained earnings show the reinvestments made throughout a company's life and reflect the financing scheme.
• X3, EBIT (earnings before interest and tax)/total assets: This ratio measures the productivity of the company's assets, regardless of tax or indebtedness factors.
• X4, Market value of equity/total liabilities: This ratio indicates the extent to which a company's assets can decline before its liabilities exceed its assets and the company becomes insolvent. When adapting it to all the companies, the numerator is replaced with equity.
• X5, Sales/total assets: This ratio, known as Turnover Ratio, shows the company's sales generating ability.

The factor to be used to multiply each X will depend on the business line of the company to be analyzed. As mentioned above, it can be a publicly traded manufacturing company, manufacturing companies in general or any type of company, as is shown in the following table:

	PUBLICLY TRADED MANUFACTURING COMPANY	*MANUFACTURING COMPANIES IN GENERAL*	*ANY TYPE OF COMPANY*
X1	1.2	0.717	6.56
X2	1.4	0.847	3.26
X3	3.3	3.107	6.72
X4	0.6	0.420	1.05
X5	0.99	0.998	0

As aforementioned, the sum of the multiplication of each X by its corresponding factor gives a Z score, which will indicate the insolvency risk. Therefore, the formula to calculate each Z would be:

- PUBLICLY TRADED MANUFACTURING COMPANY:
  - $Z = 1.2(X1) + 1.4(X2) + 3.3(X3) + 0.6(X4) + 0.99(X5)$
- MANUFACTURING COMPANIES IN GENERAL:
  - $Z = 0.717(X1) + 0.847(X2) + 3.107(X3) + 0.420(X4) + 0.998(X5)$
- ANY TYPE OF COMPANY:
  - $Z = 6.56(X1) + 3.26(X2) + 6.72(X3) + 1.05(X4)$

If each measure of X is analyzed in depth, we can determine the approach each one can have:

- **X1:** To give and to pay.
- **X2:** To do and to pay.
- **X3:** To do, to give and pay.
- **X4:** To pay.
- **X5:** To give and to pay.

As in the DuPont Method section, the original Altman Z-score Analysis will be applied and then, the complementarity principle and the suggested percentage method will be used to assign a weight to the X that has a greater impact on a specific obligation. So, on analyzing the manufacturing companies the ranges from 60/10/10/10/10 to 24/19/19/19/19 would be considered and the range 20/20/20/20/20 is used to indicate that all the accounts or ratios, i.e., all X's, are of equal importance. On the other hand, the ranges would go from 70/10/10/10 to 40/20/20/20 and the range 25/25/25/25 is used to indicate that all the accounts or ratios are of equal importance when a company of any other sector is analyzed. For example, if we wanted to analyze the solvency of any company by weighing the obligations to pay, we would use the following formula:

$Z = [(6.56*X1)*\mathbf{10}\%] + [(3.26*X2)*\mathbf{10}\%] + [(6.72*X3)*\mathbf{70}\%] + [(1.05*X4)*\mathbf{10}\%]$

Where a 70% weight is attached to X3, which specifically examines the payment capacity, and 10% to all the other X's.

The range of this analysis result may be interpreted as follows:

	PUBLICLY TRADED MANUFACTURING COMPANY	*GENERAL MANUFACTURING COMPANY*	*ANY TYPE OF COMPANY*
INSOLVENCY	1.81 or less	1.23 or less	1.10 or less
CONTROL	1.82 – 2.98	1.24 – 2.89	1.11 – 2.59
SOLVENT	2.99 or higher	2.90 or higher	2.60 or higher

Both in the DuPont Method and the Altman Z-score Analysis, the assignment of complementary weights allows the analyst to consider the accounts according to the significance intended to be attached to the obligations to be bonded, giving a bias to the indicator within the correlation to be given to each account or financial ratio in relation to the surety's risk appetite, loss ratio and experience.

Third-order analysis (contextualized): cross-check with a risk matrix

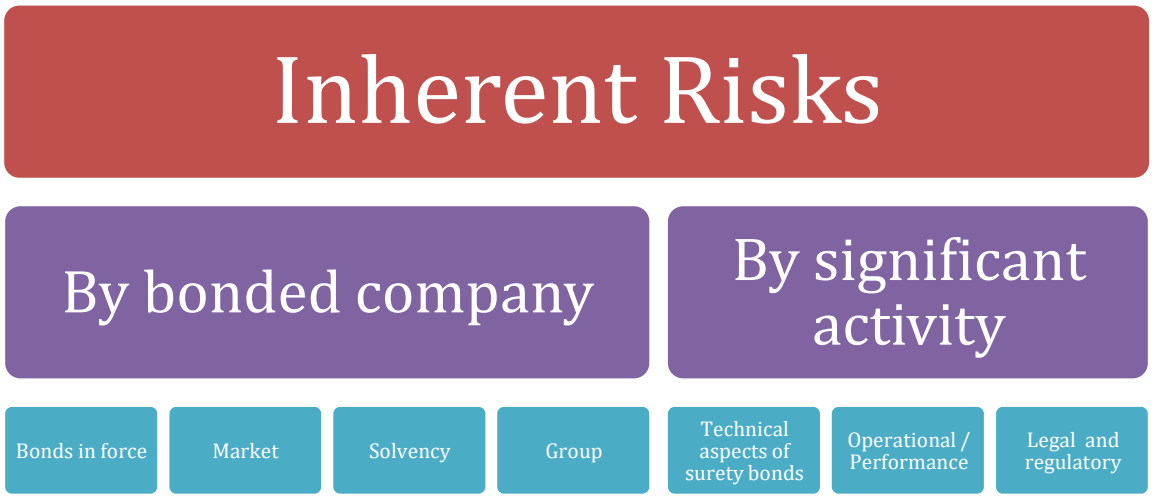
The Securities and Insurance Superintendence of Chile uses a risk assessment method called Risk Matrix, which such institution defines as the methodology that splits the company up into significant activities since they face different risks and thus the analysis becomes easier. By splitting up the activities and analyzing them separately, they can be rated and related to another indicator using a double-entry matrix.

Risk management

The initial evaluation stage makes it possible to have a better knowledge of the company and plan the implementation of the Risk Matrix to determine the significant activities, i.e., the company's core business line or activity which, if managed inappropriately, may endanger its solvency. Each significant activity must be established taking into consideration the quantitative and qualitative criteria used for the analysis.

The Solvency Evaluation Guide for Insurance Companies, Level II, issued by the Securities and Insurance Superintendence of Chile, points out that by applying a client's integrated approach where qualitative and quantitative analyses may complement each other, an assessment of the inherent credit, market and liquidity risks may be made. As the financial sector–particularly credit products–is very similar to the surety sector, the above-mentioned inherent risks may be equivalent to those of surety bonds, market and solvency, respectively.

The preceding paragraph is summarized in the following chart:



This chart shows the inherent risks by company (or client) as the aggregate bonded obligations in force; the market, business line or economic sector; the financial and moral solvency and the group of companies with which it shares financial strength and risks (joint and several obligation).

Likewise, it defines the inherent risks by significant activity, i.e., those which are part of the surety bond technical aspects (obligation, amount and performance term); the operational or performance aspects; how to meet the obligation, i.e., the technical solvency required, as well as its loss ratio; and finally, the legal and regulatory aspects, which include all clauses that

oblige the surety to render specific performance, such as on-demand payment, waiver to the proportionality right or the specific forfeiture terms regulated by law.

Finally, to evaluate the inherent risks, the guide points out that it is important to have their quantitative assessment plus the grounded opinion about the business unit, so that the cold numbers do not leave out a business which seems commercially convenient or quantitatively favorable but the underwriter's experience considers unacceptable despite the good indicators.

The purpose of this proposal is to cross-check the results of the DuPont Method with the Altman Z–score indicator in a double-entry matrix to establish the strength of the client/contractor's financial solvency. This would result in a classification segmented at three levels where the division by level rates the financial strength, while segmentation helps identify the items the underwriter would have to pay more attention to. If a case shows a strength indicator in the DuPont Method and, at the same time, one of insolvency in the Altman Z-score Analysis, this would indicate inconsistency in the reliability of the financial statements or the information provided.

The table proposed as an example is the following:

	ALTMAN Z-SCORE ANALYSIS			
	Publicly traded manufacturing companies	1.81 or less	1.82 - 2.98	2.99 or higher
	Manufacturing companies in general	1.23 or less	1.24 - 2.89	2.90 or higher
	Any type of company	1.10 or less	1.11 - 2.59	2.60 or higher
DUPONT METHOD	0% -10%	A1	B1	C1
	11% - 20%	A2	B2	C2
	21% - 30%	A3	B3	C3
	31% - 40%	A4	B4	C4
	41% - 50%	A5	B5	C5
	51% - 60%	A6	B6	C6
	61% - 70%	A7	B7	C7
	71% - 80%	A8	B8	C8
	81% - 90%	A9	B9	C9
	91% - 100%	A10	B10	C10

The green indicators show LEVEL 1, the yellow ones, LEVEL II and the red ones, LEVEL III.

For risk measurement in surety institutions, it is advisable to assess the inherent risk through an analysis of the volatility of the loss ratio in a ten-year sample, assigning a high inherent risk to those lines with higher loss ratio up to a low inherent risk to those lines with less volatility in their loss ratios.

For the underwriting of each significant activity, i.e., each new surety bond, the client's aggregate bond amounts and their distribution by line will be analyzed and cross-checked with

the risk level assigned to them by the insurance company. This may be defined as *Net Aggregate Risk*.

The company's equity position is evaluated through two complementary aspects, the qualitative and the quantitative ones. In the surety line, the qualitative equity analysis evaluates the capacity of the bonded company to increase its technical capacity to be able to meet new obligations. This will be analyzed through:

1. The capacity and willingness of the trade partners or subcontractors to assume joint and several obligations.
2. The potential of the bonded company to perform its obligation and develop its technical solvency.

As a result of this evaluation, risk mitigating or aggravating factors may appear.

The combination of the equity qualitative evaluation and the net aggregate risk assessment results in the company's final net risk.

Net Aggregate risk
+ - Equity qualitative evaluation
= Final net risk

The model evaluation proposes the following matrix as a risk rating tool:

		NET AGGREGATE RISK			
		LOW	**MODERATE**	**MIDDLE HIGH**	**HIGH**
EQUITY QUALITATIVE EVALUATION	**STRONG**	Level A: Low	Level A: Low	Level B: Moderate	Level D: High
	ACCEPTABLE	Level A: Low	Level B: Moderate	Level C: Middle High	Level D: High
	NEEDS IMPROVEMENT	Level C: Middle High	Level C: Middle High	Level D: High	Level D: High
	WEAK	Level D: High	Level D: High	Level D: High	Level D: High

Level A: bonded companies with technical solvency to withstand most conditions of the assumed obligations due to their low risk correlation coefficient.

Level B: bonded companies with technical solvency to meet other assumed obligations but with enough capacity to comply with the new obligation, which remains with a low risk correlation coefficient.

Level C: bonded companies whose technical solvency is exceeded by low-risk obligations; or bonded companies which assumed obligations with a high risk coefficient but have technical solvency to meet them.

Level D: the company's technical solvency is compromised or inadequate to meet obligations and the one assumed is highly risky; the bonded company has a high claims record. It is the most risky level.

In the financial solvency evaluation mentioned in the precedent section, equity strength is rated through a quantitative assessment and through standard and second-order financial ratios, so that the bonded companies will be classified per equity strength into the following levels:

- Level 1: Includes companies rated from B8 to B10 or from C6 to C10.
- Level 2: Groups the companies rated from B5 to B7 and C1 to C5.
- Level 3: Includes the companies rated in any segment and from B1 to B4.

The combination of the bonded company's risk level, established through the risk matrix methodology (matrix 2), and its equity strength (matrix 1) will result in the final evaluation of the bonded company, which will determine its risk position.

		NET FINAL RISK			
		LEVEL A	**LEVEL B**	**LEVEL C**	**LEVEL D**
EQUITY STRENGTH LEVEL	**LEVEL 1**	CATEGORY I: STRONG	CATEGORY II: ADEQUATE	CATEGORY III: VULNERABLE	CATEGORY IV: WEAK
	LEVEL 2	CATEGORY II: ADEQUATE	CATEGORY III: VULNERABLE	CATEGORY IV: WEAK	CATEGORY V: HIGH RISK
	LEVEL 3	CATEGORY V: HIGH RISK	CATEGORY V: HIGH RISK	CATEGORY V: HIGH RISK	CATEGORY V: HIGH RISK

Therefore, the bonded company may be classified into five categories according to the final net risk rating:

Category I: those companies in which the overall solvency is adequate to face the bonded obligations.

Category II: those bonded companies in which the bonded obligation exceeds some of the qualitative indicators despite its consolidated financial solvency; the creation of optional counterguarantees is advisable.

Category III: bonded companies where on top of Category II elements the inherent surety bond risks aggravate (such as high loss ratio, previous claims or a high level of aggregate bonded obligations). The creation of counterguarantees or recovery guarantees is recommended.

Category IV: bonded companies with a high loss probability due to their insolvency or to the nature of the surety line. The creation of recovery guarantees is advisable.

Category V: company with the highest risk, where to the inherent surety bond risk the client's high risk is added. The whole amount of the surety bond underwritten has to be guaranteed by a security interest in real property.

Conclusion

To answer the guiding question this document poses it is important to focus on the current historical moment, where risk management and particularly, financial risk management, is in full development and is an essential pillar not only for insurance and surety companies but also at a macroeconomic level. So, a model that may give relative importance to financial ratios in relation to the inherent risk level of surety bonds becomes an indispensable tool for sureties and surety insurers within the framework of safety technology update.

This document shows, as mentioned in the subtitle, that this is only a conceptual approach. To check the risk indicators it is advisable to perform a correlation analysis between the historical claims and the results of the DuPont Method and the Altman Z-score Analysis, as well as the same correlation within the contracting company with high risk but no claims.

A point of reference within this test would be the correlation analysis between the DuPont Method and the Altman Z-score Analysis without weighing the financial ratios to compare them with the correlation coefficient in the weighted methods.

Finally, it is important to point out that if after the checks the model conceptualization is not really feasible due to the low correlation of the indicators or the excessive manipulation of the variables, it is extremely important to continue working on the development of a model that may integrate the financial analysis into risk management to evaluate the underwriting of significant activities. In Mexico, in view that the commercialization of surety insurance is increasingly closer, the sureties and surety insurers have to be more skilled and specialized in risk management.