Global Connectivity, Knowledge and Innovation for Sustainability and Growth: New Paradigms of Theory and Practice

Editors

Vidya Atal
Ram Sewak Dubey

Montclair, New Jersey, USA

Capital structure of the communication sector in Mexico

Juan Gaytan-Cortes, jgaytancortes@gmail.com Juan
Antonio Vargas-Barraza, mniudg@gmail.com
Gabriel S. Fregoso-Jasso, drgabrielfregoso@gmail.com

University of Guadalajara
Marketing and International Business Department, CUCEA

Abstract

The purpose of this research was to determine the mathematical relation between, the financial country factors and the company factors to incorporate debt in the capital structure used by the industries of the communication sector that quoted on the Mexican Stock Exchange in the periods 2000-2012. The long term debt was the dependent variable and through the E-views 8.0 program, the panel data technique was applied in order to determine the mathematical relation between the independent factors. The mathematical model and the factors used for this empirical study in the research and discussion were identified into the theoretical framework. The study results are from theoretical and practical interest, identifying and understanding the relationship of the main factors by including debt in the capital structure facilitates and contributes to the normative postulates' construction.

Keywords: Capital structure, Factors of the company, and factors of the country.

Introduction

The communication industries consists of several groups of services that include the sale and use of television, telephony (fixed and mobile line), satellite, and others whose primary activity communicating information between two or more territories. This sector has been very dynamic over the past decade in Mexico, dynamism is mainly due to the application of new technologies and services, although its modernization with the digitization of the network and the launch of the first domestic satellite began in the decade eighties when the government encouraged the updating of the rules of the sector as a result of the change of development model of a closed economy to an open economy.

The research is motivated because of the absence of policies, rules or models into the real life of the companies to generate their own capital structure, implying the reviewing of theories, the empirical studies, the existing hypotheses as well as the major postulates, to determine their mathematical relationship between debt and the capital structure in Mexico companies.

Theoretical framework

The existence or not of an optimal capital structure for the companies, as well as the way it should be determined, has been one of the most controversial topics of financial literature since Modigliani and Miller (1958), published their article and showed their propositions of the irrelevance of the capital structure to the value of the enterprise.

It has been 58 years since the publication of the seminal work that gave origin to corporate finances as we know nowadays and at the same time caused that capital structures studies caught so much attention from the economy and financial areas. However, the broad research done on the capital structure theory, to this day, it's no conclusive in answers.

The theoretical models developed during the last years, have tried since to validate and generalize sometimes, the thesis of the irrelevance of Modigliani and Miller (1958); other times, the models have been tried to adjust the thesis of maximum indebtedness of Modigliani and Miller (1963).

From the convergence of both lines of research on the decade of the 60's emerged a renovated theory of the capital structure postulating the existence of an optimal structure to the proposed problem.

In this research were reviewed the following theories: optimal capital structure, Theory of the Fiscal Tax Base, Theory of the Asymmetric Information, The Theory of the Agency Costs, The Free Cash Flow Theory, The Pecking Order Theory (POT); This last theory was formally proposed by Myers (1984), based in the preliminary work of Donaldson. (1961).

The empirical studies that support all the above mentioned theories, were also reviewed, highlighting among others, the studies done by Rajan and Zingales (1995), and the study of Wald (1999), these studies offered empirical evidence for G-7 countries. They were analyzed some institutional factors of the company, such as: The total assets (size of the firm), profit, sales (growth rate), and the capital (risk). In the empirical studies, as well as the financial theories, the knowledge has increased and evolved; however, in the different researches done hasn't been achieved the construction of a model that includes jointly all the factors considered capital structure determinants, among the published investigations, we can mention the ones made Filbeck and Gorman (2000), Bradley, Chung (1993), Van el Der (1989), Kester (1986), Harrel and Kim (1984).

The empirical evidence suggests that besides the specific factors of the company also the macroeconomic factors o**r** institutional of each country are important of the capital structure (Booth, Aivazian, Demirguc-Kunt, and Maksimovic, (2001), Antoniou, Guney, and Paudyal (2008), Gaytan and Bonales (2009), Dias, Thosiro and Cruz, (2009), Dias and Toshiro (2009). Nevertheless, the most part of the theoretical debate and empirical about the incorporation of the debt in the capital structure, has stayed conditioned by well-developed the capital markets and with a financial architecture well structured, Singales (2000).

Arias, M., Arias, L., Pelayo and Cobián (2009), argued that is necessary to do an specialized research about this matter in the Mexican companies with the purpose of achieving a better understanding about their contracting and debt decisions, in order to design appropriate financial instruments to their financial needs and to facilitate and support their growth.

Macroeconomic factors of country and capital structure

The recent empirical evidence suggests that the specific factors of every country are important aspects in forming the capital structure in the companies of emerging markets, (Booth, Aivazian, Demirguc-Kunt and Maksimovic, (2001); Antoniou, Guney and Paudyal, (2008); Gaytan and Bonales (2009); Dias, Thosiro and Cruz, (2009); Dias and Toshiro (2009). Suggest that the specific factors in the explanation of decisions of debt contracting of companies are related to the economic environment and institutional mechanisms of each country, as the financial sector, tax system, legal system and accounting practices.

In the studies done about the main factors of the country, considered as determinants in building the capital structure of the companies, has been found that they have a significant impact, among others the following factors: i) Income tax rate), ii) inflation, iii) interest rate iv) the exchange rate. Therefore in this research of the manufacture and services sector this four macroeconomic factors of the country were considered.

Microeconomic factors of the companies

It has been looked for to identify the microeconomic factors of the companies that could be relevant to form their capital structure, with the purpose of testing and validating the theories supporting them.

Among the factors of the companies that can act as significant in forming of his capital structure, in the empirical studies done by Dias, Toshiro and Cruz. Gaytan and Bonales (2009), Dias and Toshiro (2009), they foun significant relation when incorporated debt in the capital structure, in the following factors: i) total assets, ii) operation profit, iii) capital, iv) net sales. Therefore in this research of the communication sector were include these four microeconomic factors of the companies.

Hypothesis

The Income tax rate, the interest rate, the operation profit, the exchange rate and the capital are factors that are negatively related; on the contrary the inflation, the total assets and the net sales are factors that are positively related, incorporating debt in the capital structure used by the companies of the communication in Mexico.

Methodology

The econometric model of the panel data was chosen and was used to calculate the mathematical relationship of the factors, the sample of the factors was used for the period from 2000 - 2012, the technique of this model combines data of temporary dimension and cross-section cut. The analysis of the panel data, studies the data set, putting together the cross section cut and the time series. The available information is processed and presented in two dimensions, generating multiple observations for each economic unit, enriching the empirical analysis.

The econometric model of panel data will be used to process information, which includes a sample of factors for a determined period of time, so it combines temporary dimension and cross-sectional data. The model is also known as longitudinal joint, grouped data, combination of data in time series and transversal, micro panel data, event history analysis (Gujarati, 2003).

The panel data technique allows developing and testing complex models, according to Carrascal (2004), applies on the following areas: a) forecast sales, b) studies and forecasting costs, c) Financial analysis, d) Macroeconomic prediction e) Simulation, f) Analysis and evaluation of any statistical data. It also allows to observe the causal inferences of independent factors on the dependent factors, such inferences of causality would be very difficult to understand if isolated it was only applied the technique of "cross-sectional data" or the technique of time series data".

The panel data analysis (or longitudinal) joint simultaneously the cross-sectional study with the time series study which captures the heterogeneity of economic agents and incorporates the dynamic analysis. (Rivera, 2007), (Mayorga & Muñoz 2000).

The key feature of panel data, which distinguishes them from the combinations of cross section, is the fact of having and following the same entities or companies over a sustained period of time (Wooldridge, 2001). In the data organization, the data for the thirteen years of each company are located contiguously, the first year before the second. For almost all practical purposes, this is the usual sort of panel data sets. The availability of information is presented, therefore, in two dimensions, generating multiple punctual observations for each economic unit (Mur & Angulo, 2006).

In economics is frequent that data sets time series combine in cross-sectional with units or that in the cross-sectional they are considered firms, countries, states, etc., so that an application of techniques for separate study leaves unanswered questions. The panel data analysis studies the group putting together the cross-sectional data technique with time series. (Rivera, 2007), (Mayorga & Muñoz 2000).

A panel data set (or longitudinal) states simultaneously from cross-sectional data and time series. This is when you have comments on certain characteristics of a set of agents (individuals, countries, companies, etc..) over

a continuous period of time. The available information is presented in two dimensions, generating multiple punctual observations for each economic unit (Mur & Angulo, 2006).

The model recognizes two effects, firstly the individual effects which refer to those who affect unequally each of the agents contained in the sample study and second to the temporary effects which affect both all individual units of study that do not vary with time. This allows studying changes in the benefits of a single company over a period of time as well as a variation on the benefits of several businesses together (Pindyck, 2001).

Thanks to this method the effects that are not observable in data purely cross-sectional or time series can detected and measured, thus they enrich the empirical analysis in a way that would not be possible if only the other methods were used in an isolated way. (Rivera, 2007), (Gujarati, 2003).

Model specification

It was used the fixed effects model. This model takes into account the unique characteristics of each unit (company) of the cross section, causing the intercept vary for each unit, however, assumes that the angular coefficients are consistent between the units. The estimation was performed using the method of least squares (GLS) because it provides the most robust results for the characteristics of our study sample, at the same time the White contrast was used to identify heteroscedasticity and this was corrected by cross section weighting.

The dependent variable is represented by the long-term liabilities presented by each of the companies in the sample, also, within the regressors and as the independent variables, are the integration of each of the internal factors of the firm that could affect the debt integration in capital structure, which are specified within a common factor, so, EViews will include a single coefficient for each variable; to correct the heteroskedasticity problem the calculation of variances and standard errors consistent to White heteroskedasticity will be included; to avoid the multicollinearity problem, initially each of the variables will be analyzed on a bivariate way and jointly afterwards, adjusted by the exclusion of factors technique; to verify a possible autocorrelation, we will use the statistic from Durvin-Watson.

The model that we will follow is the fixed effect, establishing a ratio of interception by differential intersection dichotomous variables, with the journey across weighting option, using the following equation:

$$Y_{it} \qquad D_{2i} \qquad D_{3i} + ... \alpha_n D_{ni} \qquad {}_2 X_{2it} \qquad {}_3 X_{3it} \qquad {}_n X_{nit} + \mu_{it}$$

(1)

With $i = 1,......N;$ $\quad t = 1,...T.$
Where:
i = refers to the individual or unit of study (cross section)
t = time dimension
$\quad$ = vector of intercepts of n parameters
$\quad$ = is a vector of K parameters
X_{it} = is the i-th observation at time t for the K explanatory variables
The total sample of observations in the model would be given by: N x T. (Mayorga and Muñoz, 2000) and (Pindyck and Rubinfeld, 2001).

Source and data collection

The specific variables of the companies were obtained from the financial statements published in the financial yearbook of the Mexican Stock Exchange, the source is very reliable, according to the specific laws, the companies listed on the Stock Exchange have the obligation to generate reports at the end of each quarter (Schneider, 2001).

The macroeconomic data were obtained by databases and publications made by the Bank of Mexico. The study was not probabilistic, because all the companies from the communication sector that were listed in periods 2000-2012.

This research considered the dependent variable: The Long-Term Liabilities. We also considered eight independent variables, of which four are company-specific variables: Total Assets, Net Sales, Operating Income and Capital, and the other four are the country's macroeconomic variables: Income Tax Rate (ITR), Interest Rate, Inflation and Exchange rate.

TABLE 1: THE COMPANIES FROM THE COMMUNICATION SECTOR

1	América Móvil S.A.B de C.V.	Telcel , Radio Mobil Dipsa S.A. de C.V., Telmex, Claro (Argentina , Brasil, Chile, Colombia, Costa Rica, República Dominicana, Ecuador , El Salvador, Honduras, Guatemala, Nicaragua, Panamá, Paraguay, Perú, Puerto Rico, Uruguay), Embratel, Net, Sample Claro, Trac Fone (Estados Unidos)	310
2	Grupo TMM S.A.B. de C.V.	Administración portuaria integral Acapulco S.A. de C.V., terminal marítima de Tuxpan S.A. de C.V., API Tampico, Almacenadora de depósito moderno S.A. de C.V., Auto convoy mexicano S.A. de C.V., Inmobiliaria TMM S.A. de C.V., otros	8
3	Empresas Cablevisión S.A.B. de C.V.	Cablevisión, YOO.	21
4	Grupo Radio Centro de México S.A.B de C.V.	XEQR-FM 107.3, XERC-FM 97.7, XERC-FM 93.7, XHFO-FM 92.1, XHFAJ-FM 91.3, XEQR-AM 1030, XEJP-AM 1150, XERED-AM 1110, XHRED-FM 88.1, XERC-AM 790, XEN-AM. 690	31
5	Teléfonos de México S.A.B. de C.V.	Integración de servicios TMX S.A. de C.V., Alquiladora de casas S.A. de C.V., Compañía de teléfonos y bienes raíces S.A. de C.V., Consorcio red uno S.A. de C.V., Teléfonos del noroeste S.A. de C.V., Uninet S.A. de C.V., Telmex USA S.A. de C.V.	385
6 - 7	Grupo Televisa S.A.B de C.V.	Cablemas S.A. de C.V., Cablevisión S.A. de C.V., Club América S.A. de C.V., Corporativo Vasco de Quiroga S.A. de C.V., Consorcio Nekeas S.A. de C.V., CVQ Espectáculos S.A. de C.V., Editora Factum S.A. de C.V., Editorial Televisa S.A. de C.V., Factum MAS S.A. de C.V., Sky DTH S. de RL. de C.V., Innova Holdings de R.L. de C.V., Innova S. de R.L. de C.V., Grupo Distribuidoras Intermex S.A. de C.V., Grupo Telesistema Mexicano S.A. de C.V., G-Televisa S.A. de C.V., Televisión Independiente de México S.A. de C.V., Multimedia Telecom S.A. de C.V., Sistema Radiopolis S.A. de C.V., Televisa Juegos S.A. de C.V.	43
8	Tv Azteca S.A.B. de C.V.	Forum Per-Terra S.A. de C.V., Azteca Holdings S.A. de C.V., AIC Televisión Azteca S.A. de C.V., Azteca Novelas S.A. de C.V., Red Azteca Internacional S.A. de C.V., Comerciacom S.A. de C.V., Estudios Azteca S.A. de C.V., Operadora Mexicana de Televisión S.A. de C.V., TVA Guatemala S.A. de C.V., TV Azteca Sucursal Colombia, Fundación Azteca, Banco Azteca, Grupo Salinas, Club de Futbol Monarcas Morelia, Club de Futbol Atlas.	346
TOTAL	GROUPS 8	CORPORATE 70	COMPANIES 1144

Source: Own elaboration, based on financial data, of the Mexican Stock Exchange 2000-2012

Analysis and interpretation of results

Application of the multivariate technique of panel data, that involved the dependent and independent variables will show the existence of the correlation between the variables confirming or rejecting the hypothesis formulated. The application of the stepwise method will show us the variables that will improve the levels of adjustment of model econometric.

After applying the multivariate technique of panel data, that involved the dependent and independent variables, the economic model showed the existence of a high correlation between the independent variables, causing multicolineality. Is, some independent variables showed a significance greater than 5%. So the null hypothesis was not rejected. The null hypothesis for each complementary hypothesis was defined as: $H_{o:}$ $B_i = 0$, where i is the independent variable to the level of significance of 5%

Alpha of Conbach

Is the average of all possible split-half coefficients resulting from the different ways of dividing the items of the scale, this coefficient varies between 0 and 1, and a value equal to or less than 0.6, usually indicates unsatisfactory reliability of internal consistency. An important property is that the coefficient alpha value tends to increase with the increasing number of items of the scale. Therefore, the coefficient alpha can be artificially inflated by inadequately inclusion of various reagents on the scale redundant. (Malhotra, 2008).

The reliability of the database developed with the results of the elaborate survey was tested through SPSS-version 20.0 software testing Cronbach's alpha was applied to measure their reliability, taking into account the average of the coefficients, results They are presented below:

TABLE 2: STATISTICAL RELIABILITY

Alpha de Cronbach	N elements
.829	9

Source: Data Spss-output version 20.0 program, using survey data.

The statistic Cronbach's alpha is considered a correlation coefficient (Molina 2008), its usefulness lies in state whether the various items of the scale are measuring a common reality, that is, if the answers to these items do not have a high correlation between yes, it means that some of the statements of the scale are not reliable measures of the construct.

It is concluded that the scaling performed with 9 items to obtain a value excellent of Cronbach's alpha of 0.829 correlation. The reliability of the scale is high so that it is possible to continue the analysis.

Proof (VIF).

The Inflation Factor of the Variables (VIF) calculated considering only the variables of the redefined model after applying the stepwise method. The result showed a decrease in the average variance inflation factor to 21.63, which is into the acceptable ranges test. (Table 3).

TABLE 3: THE INFLATION FACTOR OF THE VARIABLES (VIF)

(VIF) WITH SIGNIFICANT VARIABLES			(VIF) WITH ALL THE VARIABLES		
Variable	VIF	1/VIF	Variable	VIF	1/VIF
Total Assets	41.43	0.024137	Total Asset	131.07	0.007629
Capital	40.91	0.024447	Capital	47.45	0.021074
Interest Rate	2.14	0.467105	Interest rate	5.72	0.174754
Inflation	2.03	0.492222	inflation	4.92	0.203215
Mean VIF	21.63		Net Sales	64.99	0.015387
			Parity	5.56	0.179778
			Operating Income	33.41	0.029930
			Income tax	3.09	0.323967
			Mean VIF	37.03	

Source: Own elaboration, based on financial data, of the Mexican Stock Exchange 2000-2012

Hausman test

It was applied a panel data regression with random effects in order to generate the information needed to apply the Hausman test. The result of the Hausman test showed that it is relevant in this research, use the multivariate panel data technique (Fixed effects)

Multivariate data technical panel

The final results for the communication sector after adjusting and applying the econometric model panel technique, are shown in table No. 4.

TABLE 4: THE FINAL RESULTS FOR THE COMMUNICATION SECTOR

Dependent Variable: LONG-TERM LIABILITIES?
Method: Pooled EGLS (Cross-section weights)
Date: 03/23/16   Time: 14:40
Sample: 2000 2012
Included observations: 13
Cross-sections included: 8
Total pool (balanced) observations: 104
Linear estimation after one-step weighting matrix
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-14876625	7603946.	-1.956435	0.0534
CAPITAL?	-1.663809	0.223719	-7.437065	0.0000
INTERES RATE?	-79088314	22643351	-3.492783	0.0007
TOTAL ASSETS?	1.182678	0.119136	9.927158	0.0000
INFLATION?	1.18E+08	58452492	2.016156	0.0467

Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.945186	Mean dependent var	63323075
Adjusted R-squared	0.938632	S.D. dependent var	66028713
S.E. of regression	20402702	Sum squared resid	3.83E+16
F-statistic	144.2187	Durbin-Watson stat	1.007402
Prob (F-statistic)	0.000000		

Source: Own elaboration, based on financial data, of the Mexican Stock Exchange 2000-2012

The multivariate regression panel data fixed effects shows that parity and equity are negatively correlated and that the total assets is positively correlated to incorporate long-term liabilities, showing a model explanatory power of 0.938632

TABLE 5: FACTORS THAT HAVE MATHEMATICAL RELATION BY INCLUDING DEBT IN THE CAPITAL STRUCTURE OF THE COMMUNICATION SECTOR COMPANIES.

Concept	Capital (-)	Interest Rate (-)	Total Assets (+)	Inflation (+)
Significance	***	***	***	**

*** Significant at the 0.001 level
Source: Own elaboration based on the output results of the E-Views software (see tables No.4)

Capital

The application of the statistic proves the affirmation that the formulated hypothesis holds, the countable capital is related in a negative way in the decisions that incorporate the debt of the communication companies. Those results, agree with Mason´s job (1990), Friendly Lang (1988), the important founds that they got from the United States, match with the obtained results in this empiric study, showing negative meaning related to the passive long term.

Interest Rate

In the companies of communication sector, the result shows that Risk free interest rate is negatively related with the incorporation of liability (debt or leverage), matching the results of studies conducted by Barry , Mann, Mihov, and Rodriguez (2008), who found that firms issue more debt when interest rates are lower than historical levels.

Total Assets

In the companies of communication sector, we obtained a positive mathematical relationship of total assets with long-term liabilities. The total assets seem to be the most important factor in financing, especially for long-term debt, (Vigrén, 2009). This result agrees with the results shown in the classic article on this issue at the international level of Rajan and Zingales (1995), who researched the fundamental aspects of the capital structure of the company for the (G-7) countries during the period 1987-1991, finding that the total asset is a factor to incorporate debt, arguing that large companies tend to have a higher level of indebtedness. Other researchers like Frank and Goyal (2009), as well as Dias, Toshiro and Cruz. (2009) and Dias and Toshiro (2009), who obtained evidence in Latin American companies, including Mexican, agree with Rajan and Zingales.

Inflation

In the companies of communication sector, the result shows that inflation has a positive mathematical relationship with the incorporation of liability (debt or leverage), this result coincides with the result obtained by Gaytan and Bonales (2009), the study of multinational companies belonging to the electronics industry, established in the state of Jalisco, Mexico, they also found that the inflation rate has a positive relationship to incorporate debt in capital structure.

Conclusions

In the research the positive or negative relationship were identified of the quantitative principal factors of the country in the companies of communication sector. The mathematical model for used identify the positive or negative relationship of the principal factors it is known as statistical technique of "panel data".

The mathematical model, once defined and applied showed multicollinearity. The problem of multicollinearity demanded redefine the model, in the redefinition it was used method stepwise to improve levels of adjustment and explanation, also decreased and improved the existence of multicollinearity with the application of the test (VIF). Finally was identified the main factors that have mathematical relation with incorporating long-term debt in the capital structure of the communication sector.

The multivariate regression of panel data (fixed effects), showed the following in the companies of communication sector: capital and interest rate, have negative however the total assets and inflation have positive correlation with incorporating long term liabilities.

The results are useful for generating standards and guidelines that facilitating decision making for incorporating debt in the capital structures of companies of the communication sector in Mexico.

The results will decrease uncertainty and support the decisions about tangible and intangible assets of investment projects done by companies in the communication sector.
Factors emanating from the qualitative characteristics such as culture, power, country risk, and personal values, are aspects that can influence and change the results, reason why we suggest his inclusion in future researches.

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