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Implications of Technological Advancement in Global Competitive Market Capital Structure of Manufacture and Services Sector in Mexico: Panel Data Analysis

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EXECUTIVE SUMMARY

The purpose of this research was to determine the mathematical relation between financial country factors and company factors to incorporate debt in their capital structure used by the manufacture and services sector quoted on the Mexican Stock Exchange in the periods 2000-2012. The long term debt was the dependent variable and through the E-views program, the panel data technique was applied in order to determine the mathematical relation with 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.

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

INTRODUCTION

The absence of policies, rules or models in real life businesses to generate their own capital structure motivated this investigation. We incorporated a review of the theories, the empirical studies, the existing hypotheses and the major postulates to determine their mathematical relationship between debt and capital structure. Thus, we established a solid foundation to the problem, the questions and the established objectives. The studies of the capital structure Mexico, because of the lack of a robust model to explain the financial decisions in Mexican organizations, justifies this research, particularly in the services sector and the manufacture industry.

THEORETICAL FRAMEWORK

The financial literature since Modigliani and Miller (1958) published their article on capital structure, the existence or not of an optimal capital structure for enterprises, as well the way it should be determined, has been one of the most controversial topics. It has been 56 years since the publication of the seminal work that originated corporate finances as we know it nowadays and at the same time instigated the study of capital structures studies that attracted attention from the economy and financial areas. However, the broad research done on the capital structure theory, to this day, provides no conclusive answers.

The theoretical models developed during the last years have tried since to validate and generalize sometimes 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 in the decade of the 60s emerged a renovated theory of capital structure that postulates the existence of an optimal structure to the proposed problem. In this research, we 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, and 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 analyzed some institutional factors of a company, such as The total assets (size of the firm), profit, sales (growth rate) and capital (risk).

In the empirical studies, as well as the financial theories, knowledge has increased and evolved. However, the different studies done have not 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 by Filbeck and Gorman (2000), Bradley and Chung (1993), Van el Der (1989), Kester (1986) and Harrel and Kim (1984). Arias, Pelayo and Cobián (2009) argued that it is necessary to do specialized research in Mexican companies with the purpose of achieving a better understanding about their contracting and debt decisions in order to design financial instruments adequate to their financial needs and to facilitate and support their growth.

The empirical evidence suggests that besides the specific factors of the company, the macroeconomic factors or institutionals of each country are important in the capital structure (Booth, Aivazian, Demirguc-Kunt, & Maksimovic, 2001; Antoniou, Guney, & Paudyal, 2008; Gaytan & Bonales, 2009; Dias, Thosiro, & Cruz, 2009; Dias & Toshiro, 2009). Nevertheless, the theoretical debate and empirical research about the incorporation of debt in the capital structure has stayed conditioned by the countries that have good developed capital market and a well-structured financial architecture (Singales, 2000).

Macroeconomic Factors of Country and Capital Structure

Recent empirical evidence suggests that the specific factors of every country are important aspects in forming the capital structure in companies of emerging markets. (Booth et al. (2001), Antoniou et al. (2008), Gaytan and Bonales, 2009, Dias et al. (2009) and 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.

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

Microeconomic Factors of the Companies

We identified the relevant microeconomic factors of companies that form their capital structure, with the purpose of proving and validating the theories supporting them. Among the factors found that can be significant in forming capital structure, in the empirical studies done by Dias, Toshiro and Cruz (2009), Gaytan and Bonales (2009), Dias and Toshiro (2009), are the significant following factors: i) total assets, ii) operation profit, iii) capital and iv) net sales. Therefore, in this research of the manufacture and services sector this four microeconomic factors of the companies were considered.

HYPOTHESIS

The interest rate, the operation profit, the exchange rate, the fiscal tax rate and the capital are factors that are negatively related. In contrast, inflation, total assets and net sales are factors that are positively related, incorporating debt in the capital structure used by manufacture companies and the services sectors in Mexico.

METHODOLOGY

The econometric model of the panel data was chosen and used to calculate the mathematical relationship of the factors. The sample of the factors used was for the period from 2000 to 2012. The technique of this model combines data of temporary dimension and cross-section cut. The model is also known as longitudinal joint, gathered data, times series and cross-section, micro-panel data, history analysis and peer analysis (Gujarati, 2003).

The analysis of the panel data studied the data set, putting together the cross section cut and the time series. The available information was processed and presented in two dimensions, generating multiple observations for each economic unit, enriching the empirical analysis (Rivera, 2007; Mayorga & Muñoz, 2000; Gujarati, 2003, Mur & Angulo, 2006; Rivera, 2007).

SOURCE AND DATA COLLECTION

The specific variables of the companies were obtained from financial statements published in the financial yearbook of the Mexican Stock Exchange. The source is very reliable. According to 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 transformation and commerce sector that were listed in 2000-2012 periods were considered. According to the stratification of the Official Journal of the Federation of Mexico, published in June 2009, all are classified as large companies.

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.

ANALYSIS AND INTERPRETATION OF RESULTS

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 multicollinearity. 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 $H_0: B_i = 0$, where i is the independent variable to the level of significance of 5%.

Test (VIF). The inflation factor of the variables variance must be less than 10. The (VIF) calculated considering all the variables in the two sector showed to be outside of range. The test was repeated, considering only the variables of the redefined models after applying the stepwise method. The results showed a decrease in the average variance inflation factor to 3.82 and 3.89, which is within the acceptable range (see Table 1).

TABLE 1: (VIF) BY INDUSTRY

MANUFACTURE (VIF) With significant variables			SERVICES (VIF) With significant variables		
Variable	VIF	1/VIF	Variable	VIF	1/VIF
Net Sales	5.80	0.172447	Net sales	2.29	0.437061
Capital	5.78	0.173110	Capital	3.59	0.278919
Income Tax	1.84	0.544071	Operating Income	5.79	0.172735
Exchange Rate	1.87	0.533767			
Mean VIF	3.82		Mean VIF	3.89	

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

Manufacture: the multivariate regression of panel data (fixed effects) shows that the net sales, exchange rate and income tax have a positive correlation and the capital has a negative correlation incorporating the long term liabilities (Table 2).

TABLE 2: MANUFACTURE: FINAL RESULTS, AFTER APPLYING THE DATA PANEL TECHNIQUE, USING THE E-VIEWS 8.1 PROGRAM

Dependent Variable: LIABILITIES?				
Method: Pooled EGLS (Cross-section weights)				
Date: 06/13/15 Time: 12:34 Sample: 2000-2012				
Included observations: 13 Cross-sections included: 15				
Total pool (balanced) observations: 195				
Linear estimation after one-step weighting matrix				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Net Sales	0.647371	0.044484	14.55301	0.0000
Exchange Rate	44191.17	13412.12	3.294869	0.0012
Income Tax	4897743.	845385.4	5.793503	0.0000
Capital	-0.510551	0.043735	-11.67378	0.0000
Fixed Effects (Cross)	Weighted Statistics			
R-squared	0.952531	Mean dependent var		12901683
Adjusted R-squared	0.947677	S.D. dependent var		13137258
S.E. of regression	3972068.	Sum squared resid		2.78E+15
F-statistic	196.2066	Durbin-Watson stat		1.079329
Prob(F-statistic)	0.000000			

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

Services: the multivariate regression of panel data (fixed effects), shows that the Capital and net sales have positive correlation and the operating income has negative correlation incorporating the long term liabilities (Table 3).

TABLE 3: SERVICES: FINAL RESULTS, AFTER APPLYING THE DATA PANEL TECHNIQUE, USING THE E-VIEWS 8.1 PROGRAM

Dependent Variable: LIABILITIES?				
Method: Pooled EGLS (Cross-section weights)				
Date: 06/13/15 Time: 12:56				
Sample: 2000-2012				
Included observations: 13				
Cross-sections included: 6				
Total pool (balanced) observations: 78				
Linear estimation after one-step weighting matrix				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Capital	0.359874	0.034193	10.52480	0.0000
Net Sales	0.538669	0.063606	8.468805	0.0000
Operating Income	-1.072066	0.161484	-6.638839	0.0000
Fixed Effects (Cross)	Weighted Statistics			
R-squared	0.911276	Mean dependent var		2029654.
Adjusted R-squared	0.892464	S.D. dependent var		2436402.

S.E. of regression	259185.8	Sum squared resid	4.64E+12
F-statistic	979.9967	Durbin-Watson stat	1.056882
Prob(F-statistic)	0.000000		

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

TABLE 4: IMPORTANT FACTORS THAT HAVE MATHEMATICAL RELATION IN INCORPORATING LONG-TERM LIABILITIES IN THE CAPITAL STRUCTURE OF THE MANUFACTURING AND SERVICE SECTORS

CONCEPT	Net Sales	Capital	Income Tax	Exchange Rate	Operating Inc. (+)
Manufacture	***	***	***	**	
Services	***	***			***

Source: Own elaboration with the results of the E-Views 8.1 program

CONCLUSIONS

In the research the positive or negative relationships were identified of the quantitative principal factors of the country and the manufacture and services sectors. The mathematical model used identified the positive or negative relationship of the principal factors, known as "panel data."

Mathematical models, once defined, showed multicollinearity. The problem of multicollinearity demanded redefining the models. In the redefinition the stepwise was used to improve levels of adjustment and explanation. Also there was a decreased and improved existence of multicollinearity with the application of the test (VIF). Finally, the main factors were identified that have mathematical relation with incorporating long-term debt in the capital structure of the manufacturing and service sectors. The multivariate regression of panel data (fixed effects), showed the following:

1. Manufacture sector: the net sales, exchange rate, and income tax have a positive correlation. Also, the capital has a negative correlation with incorporating long term liabilities.
2. Services sector: the capital and net sales have a positive correlation and the operating income has a negative correlation with incorporating the long term liabilities.

The results are useful for generating standards and guidelines that facilitate decision making for incorporating debt in the capital structures of companies of the manufacture and services sectors in Mexico. The results will decrease uncertainty and support the decisions about tangible and intangible assets of investment projects done by companies in the manufacture and services sectors. Factors emanating from the qualitative characteristics, such as culture, power, country risk and personal values, are aspects that can influence and change the results.

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