Journal of Management & Business Studies

ISSN 2452-5340 / Vol. 5 • Nº 1 Recibido: 16/ noviembre /2023 • Aprobado: 12/ marzo /2024

Contribution to EVA from Debt and Equity

Contribución de EVA desde la Deuda y el Patrimonio

Iván Araya Canelo[1]

Universidad Autónoma de Chile

Fernando Crespo Romero[2]

Universidad Alberto Hurtado

Autor para correspondencia: *Iván Araya. Correo: nacanelo@outlook.cl*

SUMMARY

Attempts to measure the economic value contributed to the company by the capital structure present various methodologies that bring together large working teams, whose proposals focus their analysis from the characteristics of the manager to models adjusted to their life cycle. This research addresses this problem by measuring the contribution to economic value through the capital structure, using the Economic Value Added (EVA) method as a basis, and then modifying its analysis variables to quantify the economic value added from debt and equity, which in this work is called Modified Added Economic Value (MEVA). A methodology is proposed to estimate the incremental economic value per monetary unit of financial debt acquired. The main results show that MEVA captures the disaggregated performance of debt and equity management. Moreover, to the extent that profit tax increases, debt is more desirable than equity issuance.

Keywords: EVA, Capital Structure, Leverage, Value Creation

RESUMEN

Los intentos por medir el valor económico aportado a la empresa por la estructura de capital presentan diversas metodologías que congregan a amplios equipos de trabajo, cuyas propuestas enfocan su análisis desde las características del administrador hasta modelos ajustados al ciclo de vida de la empresa. Esta investigación aborda esta problemática midiendo la contribución al valor económico a través de la estructura de capital, utilizando como base el método del Valor Económico Agregado (EVA) y luego modificando sus variables de análisis para cuantificar el valor

1 Iván Araya Canelo, in affiliation with the Universidad de Santiago de Chile, in the city of de Santiago Chile. Bachelor of engineering from the Universidad Diego Portales; Mater´s in Business Administration from the Universidad de Santiago de Chile; Doctorate in Administrative Sciencie from the Universidad de Santiago- Chile.

2 Civil Industrial Engineer and Civil Mathematics Engineer from the University of Chile, Doctor of Science from the Pontifical Catholic University of Chile. Professor of Operations, Universidad Alberto Hurtado, Santiago-Chile.

doi: 10.32457/jmabs.v5i2.2356

económico agregado procedente de la deuda y el patrimonio, que en este trabajo se denomina Valor Económico Agregado Modificado (MEVA). Se propone una metodología para estimar el valor económico incremental por unidad monetaria de deuda financiera adquirida. Los principales resultados demuestran que el MEVA captura el desempeño desagregado de la gestión de la deuda y el patrimonio. Además, en la medida que aumenta el impuesto sobre las ganancias, la deuda resulta más deseable que la emisión de capital.

Palabras claves: EVA, Estructura de capital, endeudamiento, Creación de Valor

1. INTRODUCTION

One of the most widely used tools for measuring business performance is Economic Value Added (EVA). (Mclaren, 2005)known by its acronym in English: EVA. This measure shows the economic performance of a company's operation after decisions have been made and implemented. It is not a measure of expectations like Net Present Value (NPV), rather, EVA measures performance on the ground (Jakub et al., 2005). (Jakub et al., 2015; Kyriazis et al., 2007).

EVA is a measure of the performance of the strategies implemented by the company, which measures ex post business performance, which allows improving management systems, it is also a good method of management motivation and allows fostering strategic thinking. (Jakub et al., 2015).. Undoubtedly, this methodology encounters problems that impede its adequate calculation, such as, for example, agency problems at the time of preparing the accounting statements (Eisenhardt, 1989; E. Fama, 1980; E. F. Fama & Jensen, 1983; Knight, 1921; Sutherland, 1945). The effect of incomplete markets also has to be dealt with (Miao, J., & Wang, N. 2007; Geanakoplos, 1990; Greenwald & Stiglitz, 1986) and the imperfect information of emerging markets (Gulati & Garg, 2022; Hsu, K. W., & Liao, S. Z.. (2018); Ahmed, S., & Zlate, A. 2014; Jacque et al., 2001; Kyriazis et al., 2007).

The focus of the EVA calculation is on considerations of investment performance. However, it is not possible to know the share of debt and the use of equity in value creation. The approach proposed in this article, based on the modification of EVA, allows us to answer an additional question: How much does the capital structure contribute to value creation?

This paper aims to measure the contribution to the economic value of the firm from the financing mix using a new expression of EVA.

The benefits of this approach will allow corporate governance to define the borrowing rule and structure compensation to executives responsible for meeting the debt target range, thus avoiding agent moral hazard (Jensen, 1986; Holmstrom & Milgrom, P., 1991).

Methodologically, this research is quantitative-exploratory and aims to demonstrate the suitability of using EVA as a methodology to measure the economic value creation provided by debt and equity.

2. MEASURING EVA FROM DEBT AND EQUITY

EVA is a methodology that seeks to measure the creation of economic value contributed by a company to its shareholders on an intertemporal basis, preferably considering accounting information (Bonilla, 2010; López, 2016; Rodríguez, F. J. A., Beltrán, J. M., & Cervantes, L. M. C., 2018; Tellez, J., Agudelo, G. A, Franco, L. C., & Franco, L. E., 2018;

Hsu, K. W. & Liao, S. Z., 2018; Guermat, C., Misirlioglu, I. U., & Al-Omush, A., 2018).

The procedure for measuring the economic value proposed in this study considers only the financial debt and the equity contribution, which includes retained earnings and the exercise, leaving out current and non-current liabilities accounts that generate implicit costs such as suppliers, tax and salary obligations, provisions or commitments with related companies or other accounting items unrelated to financing from the financial system and shareholders. In this sense, debt and equity finance working capital and its short-term variations, as well as necessary investments in fixed assets.

It is assumed that EVA_t is the economic value added in *t*; $BOAIDT_t$ is the operating profit before interest and after tax *k*; is the weighted average cost of capital[3], and A_{t-1} is the value of the assets available for operation for the period *t*

Then it will be said that:

$$EVA_t = BOAIDT_t - k\,A_{t-1} \quad (1)$$

The investment required at the start of the operation, A_{t-1} The investment required at start-up produces a cost for the use of the capital that the company makes equivalent to:

Where:

$$k = \frac{P_{t-1}\,ke_{t-1} + D_{t-1}\,kd_{t-1}\,(1-T)}{A_{t-1}} \quad (2)$$

Nomenclature	Definition
P_{t-1}	Represents Total Equity at the time. *t* - 1
ke_{t-1}	It represents the shareholder's expected return at the time. *t* - 1
$P_{t-1}\,ke_{t-1}$	It represents the expected cost to be paid by the company at the time to the owners. *t* to the owners.
D_{t-1}	It represents the bank debt or outstanding balance owed by the company to the financial system at the time. *t* - 1.
kd_{t-1}	Represents the lender's expected return at the time of the loan. *t* - 1.
$D_{t-1}\,kd_{t-1}$	It represents the tax effect of the payment of the bank debt to be paid by the company at the time.
kd_{t-1} y ke_{t-1}	These are the rates of return that the company is committed at the time to pay at the time for the use of the debt and to the owners for the use of the equity they have invested,. $D_{t-1} + P_{t-1}$.
$A_{t-1} = D_{t-1} + P_{t-1}$	It represents the total resources available to create a given economic value at a given point in time. which is equivalent to the assets of the company.

3 Weighted average cost of capital (WACC) is also known as Weighted Average Cost of Capital.

Putting equation 1 and equation 2 together, the EVA_t is as follows:w

$$EVA_t = BOAIDT_t - P_{t-1}\, ke_{t-1} - D_{t-1}\, kd_{t-1}\,(1-T) \quad (3)$$

Where $BOAIDT_t$ is deducted the weighted cost of the resources put into action since the moment $t-1$. In other words, the structural costs of the operation have been subtracted from the income of the operation. Therefore, the growth of wealth, in the following period is reflected *EVA* in the new value acquired by the asset:

$$A_{t-1} = D_{t-1} + P_{t-1} \quad (4)$$

If you define a $BOAIDT_t$ as:

$$EVA_t = BOAIDT_t - P_{t-1}\, ke_{t-1} - D_{t-1}\, kd_{t-1}\,(1-T) \quad (5)$$

And then equation (5) is replaced in (3):

$$EVA_t = EBIT_t - (EBIT_t - D_{t-1}\, kd_{t-1})T - P_{t-1}\, ke_{t-1} - D_{t-1}\, kd_{t-1}\,(1-T) \quad (6)$$

$$EVA_t = EBIT_t - EBIT_t\, T + D_{t-1}\, kd_{t-1}\, T - P_{t-1}\, ke_{t-1} - D_{t-1}\, kd_{t-1}\,(1-T) \quad (7)$$

$$EVA_t = EBIT_t(1-T) + D_{t-1}\,[kd_{t-1}\,(2T-1)] - P_{t-1}\, ke_{t-1} \quad (8)$$

If the asset's yield at the time is:

$$ROI_t = \frac{EBIT_t}{A_{t-1}} \quad (9)$$

Then,

$$EBIT_t = ROI_t\, A_{t-1} \quad (10)$$

By replacing (10) in (8) and using that $A_{t-1} = D_{t-1} + P_{t-1}$:

$$EVA_t = ROI_t\, A_{t-1}(1-T) + D_{t-1}\,[kd_{t-1}\,(2T-1)] - P_{t-1}\, ke_{t-1} \quad (11)$$

$$EVA_t = ROI_t\,(D_{t-1} + P_{t-1})(1-T) + D_{t-1}\,[kd_{t-1}\,(2T-1)] - P_{t-1}\, ke_{t-1} \quad (12)$$

$$EVA_t = D_{t-1}[ROI_t(1-T) + kd_{t-1}\,(2T-1)] + P_{t-1}\,[RIO_t(1-T) - ke_{t-1}] \quad (13)$$

Where it is defined as:

$$\alpha_t = ROI_t\,(1-T) - kd_{t-1}\,(1-2T) \quad (14)$$

$$\beta_t = ROI_t\,(1-T) - ke_{t-1} \quad (15)$$

Therefore, after adjustments to the mother equation, EVA, the Modified Added Economic Value (MEVA) formula is presented:

$$MEVA_t = D_{t-1}\,\alpha_t + P_{t-1}\,\beta_t \quad (16)$$

Equation 16 shows the multipliers α_t y β_t y, the amount of debt, D_{t-1} and equity, P_{t-1} respectively, which provide the funds according to the asset structure, tax shield, cost of financial debt and rate of return delivered to the shareholder. It should be added that *t*-1 has the time value of money approach, i.e. the debt and equity put into action at the initial time of the operation before the time of the transaction.*t*.

The assumptions of this proposal are firstly, its internal nature of access to information, particularly with the use of accounting records, therefore, there is no moral hazard; secondly, when leverage is zero, the principal will require as return on investment the equivalent of the after-tax return on operational investment, expressed by $ROI(1-T)$ and third, the operational return is known.

2.1. ANALYSIS OF EVA AND MEVA

The results obtained between the two alternatives are exactly the same. Some examples will be used to analyse the goodness of the proposal, analysing the calculations of the value without debt, with debt and the effect of the tax rate on the income statement.

2.1.1. Results without debt

If the company has long-term investments in the amount of 1,000,000 monetary units (CU) without financial debt. The tax rate on profits is 40%, on the other hand, the profit before interest and taxes is CU 100,000. The EVA will be:

Step 1. Calculation of the Income Statement

Statement of income	
Accounts	**Amounts**
EBIT	100.000
INTERESTS	0
TAX	40.000
NET PROFIT	**60.000**

Step 2. Determination of the Economic Value Added, EVA:

For this case, the *BOAIDT* (see formula 1) is equal to the Net Result, therefore, by applying formula 1 of this article, the EVA will be:

$$EVA_t = 60.000 - \frac{60.000}{800.000} \times 800.000 = 0$$

When the calculation is made with MEVA the result will be:

Step 1. Determine the multipliers

The value of Alpha, is equal to 0.0690, but there is no debt. On the other hand, Beta, β will be according to formula 15:

$$\beta_t = \frac{100.000}{800.000} \times 0{,}6 - \frac{60.000}{800.000} = 0$$

Step 2. MEVA calculation

Using the formula 16, we obtain:

$$MEVA_t = 0 \times 0{,}0690 + 800.000 \times 0 = 0$$

2.1.2. Results with debt

If the company has long-term investments in the amount of CU1,000,000 and financial debt in the amount of CU200,000, with a cost of 3%, the profit tax rate is 40%, the profit before interest and tax is CU100,000, the EVA will be:

Step 1. Calculation of the Income Statement

Statement of income	
Accounts	**Amounts**
EBIT	100.000
INTERESTS	6.000
TAX	37.600
NET PROFIT	**56.400**

Step 2. Determination of the Economic Value Added, EVA:

For this case the *BOAIDT* (see formula 1) is equal to the Net Result, therefore, by applying formula 1 of this article, the EVA will be:

$$EVA_t = (100.000 - 37.600) - 0{,}0750 \times 1.000.000 = 2.400$$

When the calculation is made with MEVA the result will be:

Step 1. Determine alpha and beta multipliers

The value of Alpha, is equal to 0.0540. On the other hand, Beta, will be according to formula 15:

$$\beta_t = \frac{100.000}{1.000.000} \times 0{,}6 - \frac{56.400}{800.000} = -0{,}0105$$

Step 2. MEVA calculation

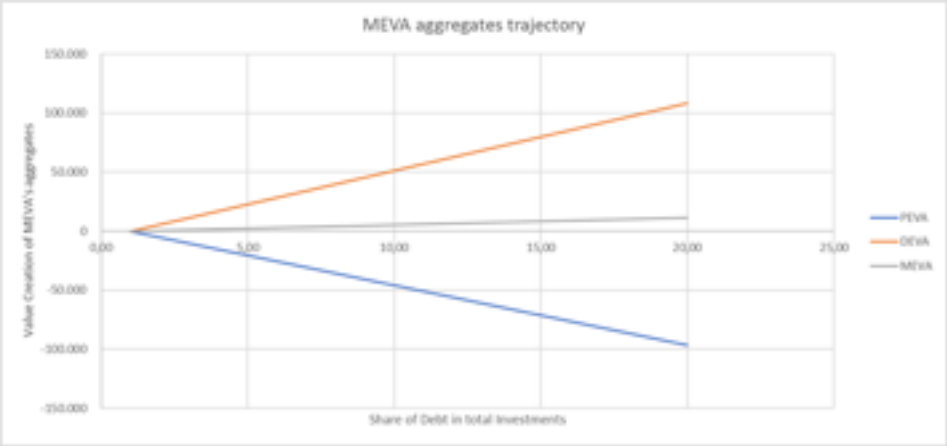
Using the formula 16, we obtain:

$$MEVA_t = 200.000 \times 0{,}0540 - 800.000 \times 0{,}0105 = 2.400$$

The first conclusion is that both methodologies deliver the same result, so both paths lead to the same place. Secondly, it is evident that debt contributes to the creation of economic value, as observed by comparing the firm with and without debt. A third relevant aspect concerns the old idea of Modigliani and Miller's (1958) propositions. In this respect, these authors analyse their proposal considering the market value of debt and equity in a context of perfect markets, whereas MEVA's proposal is more internalist in nature.

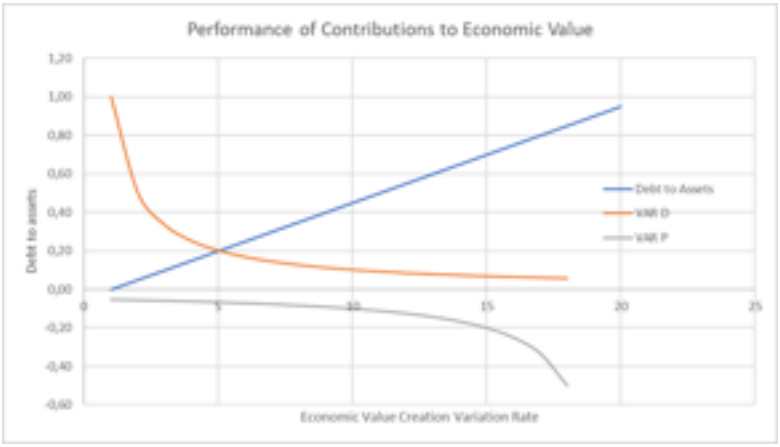
On the other hand, an analysis of the trajectory of MEVA aggregates shows that as the share of debt in total constant investments increases, the contribution of equity to economic value is decreasing, as shown in the graph:

Graph 1. MEVA aggregate trajectory



When analysing the trajectory of the contributions to economic value of both debt and equity, it is observed that, for different combinations of debt, the equity multiplier, multiplier, βtends to be negative. This implies that the contribution of equity is decreasing and that the MEVA effort falls on debt and its multiplier, α. This is seen in the trajectory of the change in equity performance (VAR P), relative to the change in debt performance (VAR D), for different combinations of debt to assets, as shown in Figure 2:

Graph 2. Performance of Contributions to Economic Value



2.1.3. Effect of the tax rate on the income statement

Table 1 presents the profit tax at different levels in column T. The level of investment is constant along with the debt-equity financing 50-50%, respectively. The contribution to the economic value of debt (DEVA) and the contribution to the economic value of equity (PEVA) are the aggregates of MEVA.

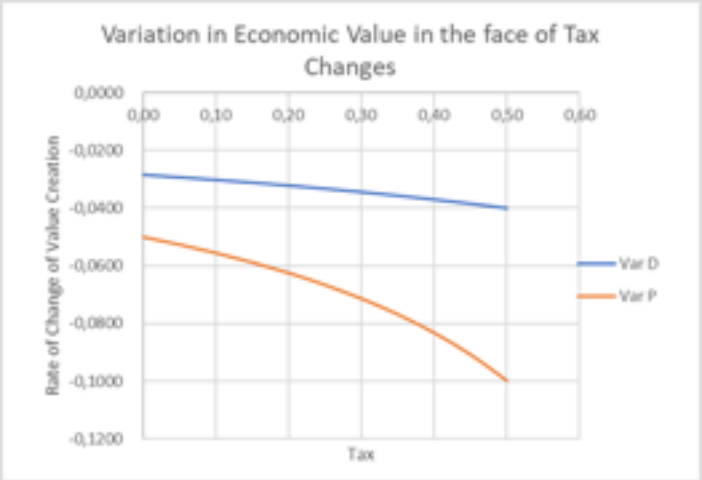
When analysing these aggregates, there is a trade-off between the multipliers in the absence of tax. However, as the tax increases, there is an incentive to take on debt instead of issuing equity.

Table 1. Tax effect on the variation of the contribution to the value of debt and equity

TAX	Assets	Debt	Equity	EDIT	Interests	ROI	ke	Alfa	Beta	MEVA	DEVA	PEVA	Var D	Var P
0,00	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1700	0,0700	-0,0700	-	35.000	-35.000		
0,05	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1615	0,0680	-0,0665	750	34.000	-33.250	-0,0286	-0,0500
0,10	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1530	0,0660	-0,0630	1.500	33.000	-31.500	-0,0294	-0,0526
0,15	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1445	0,0640	-0,0595	2.250	32.000	-29.750	-0,0303	-0,0556
0,20	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1360	0,0620	-0,0560	3.000	31.000	-28.000	-0,0312	-0,0588
0,25	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1275	0,0600	-0,0525	3.750	30.000	-26.250	-0,0323	-0,0625
0,30	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1190	0,0580	-0,0490	4.500	29.000	-24.500	-0,0333	-0,0667
0,35	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1105	0,0560	-0,0455	5.250	28.000	-22.750	-0,0345	-0,0714
0,40	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1020	0,0540	-0,0420	6.000	27.000	-21.000	-0,0357	-0,0769
0,45	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0935	0,0520	-0,0385	6.750	26.000	-19.250	-0,0370	-0,0833
0,50	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0850	0,0500	-0,0350	7.500	25.000	-17.500	-0,0385	-0,0909
0,55	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0765	0,0480	-0,0315	8.250	24.000	-15.750	-0,0400	-0,1000
0,60	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0680	0,0460	-0,0280	9.000	23.000	-14.000	-0,0417	-0,1111
0,65	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0595	0,0440	-0,0245	9.750	22.000	-12.250	-0,0435	-0,1250
0,70	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0510	0,0420	-0,0210	10.500	21.000	-10.500	-0,0455	-0,1429
0,75	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0425	0,0400	-0,0175	11.250	20.000	-8.750	-0,0476	-0,1667
0,80	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0340	0,0380	-0,0140	12.000	19.000	-7.000	-0,0500	-0,2000
0,85	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0255	0,0360	-0,0105	12.750	18.000	-5.250	-0,0526	-0,2500
0,90	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0170	0,0340	-0,0070	13.500	17.000	-3.500	-0,0556	-0,3333
0,95	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,0085	0,0320	-0,0035	14.250	16.000	-1.750	-0,0588	-0,5000

Another aspect to consider when defining strategies to improve economic performance is the effect of income tax. The findings indicate that, at higher tax rates, equity performance falls more sharply than debt performance. There are several reasons for this, but fundamentally taxation affects profits and this affects profitability. Similarly, the tax shield favours debt, as shown in Figure 3:

Graph 3. Variation in Economic Value in the face of Tax Changes



2.2. ANALYSIS OF DEBT AND EQUITY MULTIPLIERS

The debt and equity multipliers expressed in formula 14 and 15, respectively, provide dimensions of analysis depending on how MEVA is calculated. That is, whether the cost of funds of contributors, financial institutions, bondholders and shareholders is calculated internally or externally. It is understood as internal when the interest rate of the contributors is calculated from the accounting, when it is external, it is understood that the costs are at market price, calculating these costs by the value of the bonds or by metrics such as the CAPM.

If one seeks to determine alpha and beta for different combinations of debt and equity relative to the investment, it is possible to find that alpha will maintain constant amounts for internal or external calculation. However, the beta multiplier will be constant if the calculation is done with CAPM, e.g. 10%, and will be variable if it is calculated internally.

Table 2. Internal and External Measurement of Alpha and Beta

								Internal Calculation			Internal Calculation		
Debt to assets	Assets	Debt	Equity	EBIT	Interest	ROI	ke	Alfa	Beta	MEVA	Alfa	Beta	MEVA
0,00	1.000.000	0	1.000.000	100.000	0	0,1000	0,0600	0,0540	0,0000	0	0,0540 -	0,0100	-10.000
0,05	1.000.000	50.000	950.000	100.000	1.500	0,1000	0,0622	0,0540	-0,0022	600	0,0540 -	0,0100	-6.800
0,10	1.000.000	100.000	900.000	100.000	3.000	0,1000	0,0647	0,0540	-0,0047	1.200	0,0540 -	0,0100	-3.600
0,15	1.000.000	150.000	850.000	100.000	4.500	0,1000	0,0674	0,0540	-0,0074	1.800	0,0540 -	0,0100	-400
0,20	1.000.000	200.000	800.000	100.000	6.000	0,1000	0,0705	0,0540	-0,0105	2.400	0,0540 -	0,0100	2.800
0,25	1.000.000	250.000	750.000	100.000	7.500	0,1000	0,0740	0,0540	-0,0140	3.000	0,0540 -	0,0100	6.000
0,30	1.000.000	300.000	700.000	100.000	9.000	0,1000	0,0780	0,0540	-0,0180	3.600	0,0540 -	0,0100	9.200
0,35	1.000.000	350.000	650.000	100.000	10.500	0,1000	0,0826	0,0540	-0,0226	4.200	0,0540 -	0,0100	12.400
0,40	1.000.000	400.000	600.000	100.000	12.000	0,1000	0,0880	0,0540	-0,0280	4.800	0,0540 -	0,0100	15.600
0,45	1.000.000	450.000	550.000	100.000	13.500	0,1000	0,0944	0,0540	-0,0344	5.400	0,0540 -	0,0100	18.800
0,50	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1020	0,0540	-0,0420	6.000	0,0540 -	0,0100	22.000
0,55	1.000.000	550.000	450.000	100.000	16.500	0,1000	0,1113	0,0540	-0,0513	6.600	0,0540 -	0,0100	25.200
0,60	1.000.000	600.000	400.000	100.000	18.000	0,1000	0,1230	0,0540	-0,0630	7.200	0,0540 -	0,0100	28.400
0,65	1.000.000	650.000	350.000	100.000	19.500	0,1000	0,1380	0,0540	-0,0780	7.800	0,0540 -	0,0100	31.600
0,70	1.000.000	700.000	300.000	100.000	21.000	0,1000	0,1580	0,0540	-0,0980	8.400	0,0540 -	0,0100	34.800
0,75	1.000.000	750.000	250.000	100.000	22.500	0,1000	0,1880	0,0540	-0,1260	9.000	0,0540 -	0,0100	38.000
0,80	1.000.000	800.000	200.000	100.000	24.000	0,1000	0,2280	0,0540	-0,1680	9.600	0,0540 -	0,0100	41.200
0,85	1.000.000	850.000	150.000	100.000	25.500	0,1000	0,2980	0,0540	-0,2380	10.200	0,0540 -	0,0100	44.400
0,90	1.000.000	900.000	100.000	100.000	27.000	0,1000	0,4380	0,0540	-0,3780	10.800	0,0540 -	0,0100	47.600
0,95	1.000.000	950.000	50.000	100.000	28.500	0,1000	0,8580	0,0540	-0,7980	11.400	0,0540 -	0,0100	50.800

The results in Table 2 could be considered controversial, since, when changing the type of measurement, internal and external, MEVA will be different. Which of the two calculations is correct?

The answer lies in the conviction about the pragmatics of the assumptions underlying the internal and external calculation. Firstly, the internal calculation relies on the company's accounting information, and assumes that there is no moral hazard in recording and controlling the information, i.e. the agent acts in the interests of the principal. On the other hand, external measurement, considering CAPM or another available method to analyse market prices, relies on the idea that these prices contain all the information available in the market, but this faces several problems, mainly in emerging markets, either because of arbitrage strategies, or because of regulations that install incentives with moral hazard, regardless of whether the market is in the form of a semi-strong or strong, or an incomplete market. Another aspect to consider in the use of CAPM is that these results come from listed firms competing with certain investment sizes, which implies high

levels of productive development, employee learning curves and different cost structures than the unlisted firm, which may under- or overestimate MEVA. Similarly, listed firms have access to financial resources at advantageous costs compared to smaller firms, where the financial system adjusts the risk of information asymmetry for debt maturities or amounts and interest rates. Other effects, such as the degree of uniqueness, collateral, age and size of the company, idiosyncratic aspects of the principal or agent, are aspects that CAPM does not take into account when investigating systematic risk.

Understanding these complexities of the external calculation, it is estimated in this research that Ockham's razor is in favour of the internal calculation. Therefore, alpha will be constant and beta will fluctuate with different mixes of debt and equity.

When $ROI(1+T) = k_e = WACC$ implies that the company has no debt and therefore MEVA will be zero. This aspect is vital for the finance manager to incentivise the use of debt to achieve the economic value creation target. In this sense, value creation will occur when $ROI(1-T) < K_e$ in the face of different mixes of debt and equity, i.e. when $WACC < K_e$ In terms of the beta multiplier, the debt rule will be when beta is furthest to the left of zero, as shown in Table 1. In these terms, value creation only occurs through the intervention of debt. It is understood in this research that, in the absence of debt, the shareholder will take the after-tax operating return figure, $ROI(1-T)$as the cost of the contributed fund, therefore, there will be no value creation.

Graph 4. Value Creation v/s Cost of Capital

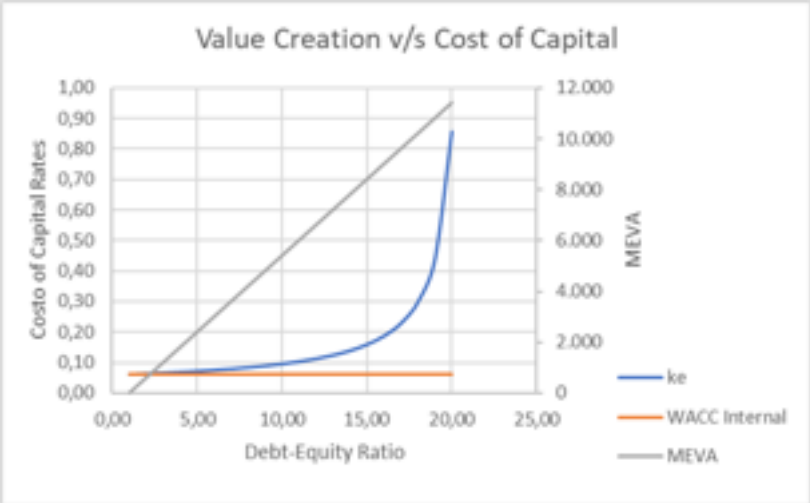


Figure 4 shows that MEVA grows at a constant rate, while the shareholder rate of return, ke, increases as financial debt increases. The latter is an incentive to take on debt, since a lower interest rate and the tax shield effect are beneficial for wealth creation. To the extent that the weighted cost of capital of the contributors is constant, Internal WACC and the owner's return increases, the debt contribution will be higher.

To determine the unit increase in MEVA with an increase in debt is to consider that if the Debt/Investment ratio in Table 3 is, for example, 5% then it will be seen that debt of CU50,000 generates an economic value of CU600. Dividing the two figures gives a ratio of CU83.33. This implies that if the debt were equal to CU400,000, then MEVA will be equal to CU4,800.

For example:

$$XX_t = \frac{D_t}{MEVA_t}$$

$$XX_t = \frac{50.000}{600} = 83{,}33\ u.m.$$

Table 4. Results of DEVA and PEVA aggregates

								Internal Calculation				
Debt to assets	Assets	Debt	Equity	EDIT	Interest	ROI	ke	Alfa	Beta	DEVA	PEVA	MEVA
0,00	1.000.000	0	1.000.000	100.000	0	0,1000	0,0600	0,0540	0,0000	0	0	0
0,05	1.000.000	50.000	950.000	100.000	1.500	0,1000	0,0622	0,0540	-0,0022	2.700	-2.100	600
0,10	1.000.000	100.000	900.000	100.000	3.000	0,1000	0,0647	0,0540	-0,0047	5.400	-4.200	1.200
0,15	1.000.000	150.000	850.000	100.000	4.500	0,1000	0,0674	0,0540	-0,0074	8.100	-6.300	1.800
0,20	1.000.000	200.000	800.000	100.000	6.000	0,1000	0,0705	0,0540	-0,0105	10.800	-8.400	2.400
0,25	1.000.000	250.000	750.000	100.000	7.500	0,1000	0,0740	0,0540	-0,0140	13.500	-10.500	3.000
0,30	1.000.000	300.000	700.000	100.000	9.000	0,1000	0,0780	0,0540	-0,0180	16.200	-12.600	3.600
0,35	1.000.000	350.000	650.000	100.000	10.500	0,1000	0,0826	0,0540	-0,0226	18.900	-14.700	4.200
0,40	1.000.000	400.000	600.000	100.000	12.000	0,1000	0,0880	0,0540	-0,0280	21.600	-16.800	4.800
0,45	1.000.000	450.000	550.000	100.000	13.500	0,1000	0,0944	0,0540	-0,0344	24.300	-18.900	5.400
0,50	1.000.000	500.000	500.000	100.000	15.000	0,1000	0,1020	0,0540	-0,0420	27.000	-21.000	6.000
0,55	1.000.000	550.000	450.000	100.000	16.500	0,1000	0,1113	0,0540	-0,0513	29.700	-23.100	6.600
0,60	1.000.000	600.000	400.000	100.000	18.000	0,1000	0,1230	0,0540	-0,0630	32.400	-25.200	7.200
0,65	1.000.000	650.000	350.000	100.000	19.500	0,1000	0,1380	0,0540	-0,0780	35.100	-27.300	7.800
0,70	1.000.000	700.000	300.000	100.000	21.000	0,1000	0,1580	0,0540	-0,0980	37.800	-29.400	8.400
0,75	1.000.000	750.000	250.000	100.000	22.500	0,1000	0,1860	0,0540	-0,1260	40.500	-31.500	9.000
0,80	1.000.000	800.000	200.000	100.000	24.000	0,1000	0,2280	0,0540	-0,1680	43.200	-33.600	9.600
0,85	1.000.000	850.000	150.000	100.000	25.500	0,1000	0,2980	0,0540	-0,2380	45.900	-35.700	10.200
0,90	1.000.000	900.000	100.000	100.000	27.000	0,1000	0,4380	0,0540	-0,3780	48.600	-37.800	10.800
0,95	1.000.000	950.000	50.000	100.000	28.500	0,1000	0,8580	0,0540	-0,7980	51.300	-39.900	11.400

3. FUTURE RESEARCH

We believe that MEVA requires some additional steps, firstly with respect to the uncertainty costs associated with raising funds either through debt issuance or equity issuance.

Among the uncertainty costs associated with investments are the opportunity costs of potential market growth. This includes uncertainty costs related to the difficulty of acquiring debt due to information asymmetries between the company and the funder, which also defines costs related to liquidity and access to credit in general; uncertainty costs related to macroeconomic expectations and currency hedging and moral hazard, which in their different configurations and functional structures will affect or enhance MEVA.

On the other hand, and considering the aforementioned aspects, the methodological problems of decision optimisation must be added. Already from MEVA and its adjustments to uncertainty costs, a non-linear model is needed to facilitate the search for global critical points, rather than local ones. On the whole, we are working on this, not

incipiently, but the first step presented in this article is required.

4. CONCLUSIONS

This paper answers the question "Can the value provided by the capital structure be measured by the Economic Value Added? For this purpose, the EVA metric has been modified, abandoning investments as the focus, replacing them with financial debt and equity.

MEVA results are shown to be equivalent to EVA. It is pointed out that the leverage ratio does not improve the cost of capital, but, as debt increases, economic value improves because the equity multiplier falls with changes in debt, which benefits the decision to take on debt. Third, the effect on MEVA per unit of debt acquired has been presented, which allows us to empirically estimate the economic value of financing decisions. Fourth, it is important to highlight the effect of the profit tax on the calculation of MEVA, since conceptually, the increase in the tax implies an incentive to use debt over equity.

Finally, it is possible to connect the internal character of MEVA measurement with the environment, i.e. market uncertainties and constraints produced by informational asymmetry, which will be addressed in future research.

Bibliography

Ahmed, S., & Zlate, A. (2014). Capital flows to emerging market economies: A brave new world? *Journal of International Money and Finance*, *48*, 221-248.

Bonilla, F. L. (2010). The economic value added (EVA) in business value. Revista Nacional de administración, 1(1), 55-70.

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of management review*, *14*(1), 57-74.

Fama, E. F., & Jensen, M. C. (1983). Agency problems and residual claims. *The journal of law and Economics*, *26*(2), 327-349.

Geanakoplos, J. (1990). An introduction to general equilibrium with incomplete asset markets. *Journal of mathematical economics*, *19*(1-2), 1-38.

Greenwald, B., & Stiglitz, J. (1986). Externalities in economies with imperfect information and incomplete markets. The quarterly journal of economics, 2(101), 229-264.

Gulati, P. A., & Garg, S. (2022). Impact of merger on stock returns and economic value added (EVA) of the acquiring firms: a study from Indian corporate sector. *International Journal of Emerging Markets*, (ahead-of-print).

Guermat, C., Misirlioglu, I. U., & Al-Omush, A. (2018). The long-term effect of economic value added adoption on the firm's business decision. Accounting Research Journal.

Holmstrom, B., & Milgrom, P. (1991). Multitask principal-agent analyses: Incentive contracts, asset ownership, and job design. Journal of Law, economics, and organization, 1-29.

Hsu, K. W., & Liao, S. Z. (2018). The Application of Economic Value Added on Green Facilities of Urban Agriculture. In E3S Web of Conferences, 57, 5001.

Jakub, S., Viera, B., & Eva, K. (2015). Economic Value Added as a measurement tool of financial performance. *Procedia Economics and Finance*, *26*, 484-489.

Jacque, L. L., & Vaaler, P. M. (2001). The international control conundrum with exchange risk: An EVA framework. *Journal of International Business Studies*, *32*, 813-832.

Jensen, M. (1986). Agency costs of free cash flow, corporate finance, and takeovers. The American economic review, 76(2), 323-329.

Knight, F. H. (1921). Cost of production and price over long and short periods. *Journal of political economy*, *29*(4), 304-335.

Kyriazis, D., & Anastassis, C. (2007). The validity of the economic value added approach: an empirical application. *European Financial Management*, *13*(1), 71-100.

López, C. (2016). Economic Value Added (EVA) and Value Based Management (VBM). Financial Analysis, 24(1).

McLaren, J., Appleyard, T., & Mitchell, F. (2016). The rise and fall of management accounting systems: A case study investigation of EVA™. *The British Accounting Review*, *48*(3), 341-358.

Miao, J., & Wang, N. (2007). Investment, consumption, and hedging under incomplete markets. Journal of Financial Economics, 86(3), 608-642.

Modigliani, F., & Miller, M.H. (1958). The cost of capital, corporation finance and the theory of investment. The American Economic Review, Vol. 48(No. 3), pp. 261-297.

Rodríguez, F. J. A., Beltrán, J. M., & Cervantes, L. M. C. (2018). Economic value added as a financial strategy for SME competitiveness. International Competitiveness Researchers Network, 5(1).

Sutherland, E. H. (1945). Is "white collar crime" crime? *American sociological review*, *10*(2), 132-139.

TELLEZ, J., AGUDELO, G. A, FRANCO, L. C., & FRANCO, L. E. (2018). The value relevance of EVA and earnings per share (EPS) under economic volatility: The case of Mexico 1998-2012. Revista ESPACIOS, 3.