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# The valuation of the share exchange ratio in stock for stock transactions. Allocation of synergies and financial implications

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**ABSTRACT**

The adequate estimation of the share exchange ratio plays a pivotal role with reference to M&As, particularly in stock for stock transactions. This paper aims to explore relevant factors impacting the share swap mechanism in establishing an appropriate range of values to attribute during absorption or consolidation transactions. The share exchange ratio – a key measure to reveal the correct number of shares to issue in exchange for each individual share of the target entity – not only has financial implications for the business combination but can also reflect the strategic dimension and the potential synergies between the merging enterprises. Therefore, by advancing a ‘comprehensive’ analysis of the economic-strategic factors and value components, we provide new insights into the complex process of determining the above-mentioned ratio. Various methodologies are examined, taking into account both the stand-alone view of the company and the potential synergies expected from the merger. In particular, we show how the synergistic value (often excluded for simplification) can be variously allocated within the swap ratio structure. To cover a gap in the literature, we propose four interconnected approaches and conclude by defining a synthesis formula based on a reasonable criterion for the potential sharing of synergies between the involved parties. Analysts, appraisers, and decision-makers can make informed decisions in approaching an optimal and balanced share exchange ratio that maximizes value creation and, in general, the M&A strategy.

La stima del rapporto di cambio è un momento cruciale nell'economia delle M&As, in particolare nelle operazioni aggregative stock-for-stock. Questo articolo si propone di esplorare alcuni fattori rilevanti, talora in parte sottaciuti, in grado di influenzare il meccanismo di concambio azionario al fine di stabilire un'adeguata gamma di valori da poter attribuire al ‘corrispettivo’ delle fusioni per incorporazione o unione (consolidamento). Il concambio, stabilendo il numero congruo di azioni da emettere in sostituzione delle azioni dell'azienda che si fonde, non solo ha implicazioni finanziarie per la combinazione aziendale in sé, ma può anche riflettere la dimensione strategica e le potenziali sinergie interaziendali. Pertanto, attraverso un'analisi "completa" dei fattori economico-strategici e dei componenti

valoriali, ci si prefigge di fornire nuove prospettive al complesso processo di determinazione del suddetto ratio. A tal fine, sono esaminate diverse metodologie tenendo conto sia della visione stand-alone sia delle sinergie attese dalla fusione. In particolare, è illustrato come il valore sinergico (spesso escluso per semplificazione nella pratica professionale) possa essere variamente allocato all'interno degli elementi della formula del concambio. Per colmare un gap nella letteratura, proponiamo quattro approcci interconnessi e concludiamo definendo una formula di sintesi basata su un criterio ragionevole di sharing delle sinergie potenziali tra le parti coinvolte. Gli analisti, i periti e i manager possono pertanto prendere decisioni più informate e complete nell'ottica della considerazione di un rapporto di cambio stabilito in maniera complessivamente ottimizzante ed equilibrata, potendo assicurare un bilanciamento di interessi tra le schiere dei proprietari del capitale azionario.

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**Keywords:** Exchange Ratio, Share Swap Rate, Mergers and Acquisitions, Consolidations, Amalgamations, Synergies, International Accounting, Fair Assessment, Corporate Structure.

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## 1 – Introduction

M&As represent a significant category of business combinations in the market of corporate control (Coyle, 2000; Cumming *et al.*, 2023) with important differences, especially regarding the consideration to be transferred. In fact, while the Acquisitions' consideration (the price of capital acquired in only cash transactions) is expressed in money (currency units) in favor of the vendor (or in shares of the acquirer capital), the peculiar, relative, 'price' (consideration) of the stock for stock Mergers (as well as demergers) is given by a special swap, namely the share exchange ratio. Despite the latter being a conventional and complex measure – in order to determine the fixed or floating number of shares the acquiring company needs to issue for each individual share of the target company, even if the deal is partially cash –, the present article aims at providing an in-depth analysis with specific reference to the possible allocation of the controversial synergistic component of the value creation process inside the investigated ratio. Such strategic aspect for stock swaps is still a gap in the literature and in practice since it is neither thoroughly addressed nor analyzed in a complete and unitary manner.

In general, as known, business combinations (M&As) can be classified according to the corporate structure. An acquisition results when one firm sells or transfers (even by spin-off / conferring) a business X or more businesses  $X_i$  to another firm that, in turn, purchases it (them) by transferring money or issuing shares, thus getting the right to manage X. When the seller transfers shares (dominant interest) the acquirer is assumed to take controlling ownership of the underlying business transferred; but also an acquisition can result when A exchanges a business or a given amount of its shares for a certain amount of shares of B, whereby A becomes the parent company and B the subsidiary. Instead, a merger (vertical, horizontal, or conglomerate) results whereby firm A is going to acquire firm B, with only firm A surviving after the combination (in fact A absorbs B). A variant of merger is consolidation (amalgamation), which results when firms A and B combine assets and liabilities to form a new firm C (newco).

An economic principle very often adopted in merger valuations is the "stand-alone" perspective, which is essentially a pragmatic rationale based on the current configuration of business models and future prospects of the companies going to merge considered on an independent basis, that is, without taking into account any potential synergies deriving from the merger or consolidation. In this case, such synergies are somehow conservatively neglected;

nonetheless, they keep on being still very critical and material since they may plausibly create concrete added value for either one or the two groups of shareholders involved.

In this light, under the Corporate Valuation (by means of the Capital Asset Pricing Model) and Behavioral theory framework (Damodaran, 2016; Goedhart et al., 2015; Palepu et al., 2020), this paper intends to find whether and to what extent synergies coming from the merger combination of firms – usually omitted (according to a rule of simplification, neutrality, and relativity) – can play an effective correct formal role inside the exchange ratio formulas. The exclusion of the synergistic value would imply that it is prevailing the logic of value sacrifice in place of value creation.

That said, the remainder of the paper is organized as follows. Section 2 briefly provides the theoretical background and then the question of the research concerning the vital ratio investigated. Section 3 presents the share exchange formulas in mergers by absorption and in consolidations (amalgamations of firms), focusing on fair determination and conventional adjustments. Section 4 adopts a strategic perspective of analysis, and it illustrates the reasonable consideration of synergies, showing alternatives and numerical examples on the basis of four interlocking options of attribution in stock for stock transactions. Section 5 expresses our concluding remarks, while, in the end, the bibliographic references are placed.

## 2 – Theoretical background and the question of the research

As stated, through a common merger two firms combine themselves in the way that one firm (acquirer) absorbs another (the target) which ceases to exist (though in a reverse merger the absorbing company is in substance the target). Through a consolidation (amalgamation) a new firm is created after the merger of two or more firms, which receive stock of the former (in case firms have the same or similar size: merger of equals). Mergers and consolidations allow complete absorption or unification of businesses, whereas financial acquisitions of stock, in turn, are often unfriendly and do not require a vote nor management consent (indeed, in such a case it is a matter of ownership). Mergers are known in various type in business practice (Bruner and Perella, 2004; Hakkinen and Hilmola, 2005; Lynch and Smith, 2006; Faulkner et al., 2012; Nelson, 2018):

- Horizontal: the absorbing company and target company operate in the same industry (as competitors);
- Vertical: the absorbing company sells to or buys from the target (products are required at different stages of the production cycle);
- Conglomerate: companies involved operate in unrelated industries and merge for diversification (or risk reduction).

A general objective of mergers is quick business growth via external way (much quicker than internal growth) potentially without cash payment. Mergers identify a growth strategy (Collins and Montgomery, 1997), but motives behind them can be several, economic and meta-economic. However, a recurrent feature is that they historically come in waves (Andrade et al., 2001; Bureau Van Dijk, 2020), in turn, correlated with increases in share prices and in price/earnings ratios as well (together with stock market booms and euphoria in financial markets). Such waves are differently explained.

The neoclassical theories for merger waves are exposed by Jovanovic and Rousseau (2002) and Harford (2005) as well. Such theories assume that capital markets are efficient, cannot be driven by optimism and managers would always maximize shareholder wealth.

In contrast with the neoclassical theories, the behavioral theories of economics and finance (as the managerial discretion theory and the overvaluation theory) are based on psychological stimulations and concrete behaviors of managers, and of resulting markets as well (Shleifer and Vishny, 2003; Gugler et al., 2012). The managerial theory is interesting because it takes into proper account mergers financed by cash or debt (merger leveraged buy-out).

As regards the share swap / exchange ratio in mergers (the compensation 'paid' to the acquired entity in the form of shares of the acquiring entity), the academic research and best practice on such conversion ratio consider its determination a hot topic in economic valuation. Jensen (1986) and Buckley and Casson (2016) adopt the event research method to test how merger performance can create wealth, especially for shareholders of target companies (resulting more intensely in the short term).

Moeller et al. (2005) show huge wealth destruction with abnormal returns of -12 percent to acquirers during the 1998-2001 merger wave. Among the others, two are the main modern models known in pertaining research: the L-G model (Larson and Gronede, 1969) and the Yagil (1987) model.

The former sees the price/earnings ratio and price/book value ratio as adequate parameters to determine the swap ratio for mergers (based on the constraint that the wealth of both shareholders is not reduced, and the synergies of the merger are excluded); the latter expands the analysis introducing growth expectation and dividend growth (Gordon, 1962), then calculating the proportional boundary value.

Empirical tests for the L-G and Yagil models are reported in Conn and Nielsen (1977), Conn (1985), Conn et al. (1991), Cooke et al. (1994), Rossi (1999), Bae and Sakthivel (2000), Andrade et al. (2001), Moretto and Rossi (2008). Some of these works re-examined from an analytical viewpoint the inequalities of L-G and of Yagil exchange ratio static determination. Moreover, Cigola and Modesti (2008) looked for a possible valuation of future dividends through a dynamic approach.

It is to remark here that in acquisitions or takeovers, the bidders are often used to pay a large premium (approximately 30%-40% of the price) to recognize the value of synergies (Antoniou et al., 2008; Eckbo, 2008). From the acquirer's perspective, the merger is a positive net present value project to the extent that the implied consideration premium does not exceed the predicted synergies that are supposed to be created thanks to the business combination. Synergies (Sirower, 1997) originated variously as for (Chatterjee, 1986; Damodaran, 2004; Homberg et al. 2009): cost-reductions, revenue-enhancements, economies of scale, economies of scope, vertical integrations, expertise, and managerial knowledge gains, competition, technology and innovation (Bena and Li, 2014); monopoly gains, efficiency gains, financial synergies (Leland, 2007), tax savings, etc. The gains for acquirer shareholders are = Synergies expected – Premium recognized. The same issue characterizes a merger combination and the parties involved in it. Nonetheless, synergy value is often not disclosed explicitly in mergers nor incorporated in the related exchange ratio swap.

Hence, the *question of the research* (RQ) represents a development of previous studies aimed at systematizing such contributions and filling a gap in the literature.

**RQ:** *How can the share swap / exchange ratio formulas be plausibly completed or formally integrated by synergies value determined under a strategic combination point of view addressed to value creation in mergers and consolidations?*

We will answer by proposing alternative hypotheses pointing out the alternative allocation of the S (synergy) component inside the SER (share exchange ratio) financial architecture, under both the acquirer and target perspectives, and trying to match them in a unitary framework.

### 3 – The share exchange ratio in mergers by absorption and conglomerations. Fair determination and adjustments

The main issue in merger valuations is determining a fair exchange ratio as relative price or specific consideration of the business combination with complete or partial absence of cash deal: it expresses the ratio between the values of the respective shares of companies (acquirer and target) involved in the transaction. For that reason, the standard valuation theory and practice (for example, in Italy) are inclined to set particular attention to the principle of consistency in the stock capital valuation criteria to be applied. Indeed, the purpose of merger valuations is not so much the determination of the absolute economic value of the companies that are merging, but rather the evaluation of the relative unit values that can be compared to each other in order to obtain a correct exchange ratio. In other terms, merger valuations are meaningful as relative valuations more than as absolute valuations of the companies. The plain formula to obtain the exchange ratio between shares of the acquirer (A) e shares of the target (T) can be written as the following one, for mergers by absorption (further, we show SERs for consolidations):

$$SER = \frac{W_T}{W_A} * \frac{N_A}{N_T} = \frac{w_T}{w_A}$$

Where  $W$  is the corporate economic value (wealth),  $N$  is the number of shares standing before the merger and  $w$  is the economic value per share. SER indicates the number of new shares issued by A to give in exchange for each share of T.

At least two initial adjustments are important to pass from the pure or theoretical SER above calculated to the actual SER: i) adjustment for rounding the mathematical fraction obtained (along with monetary settlements); ii) adjustment to neutralize any percentage  $a$  of shareholding already held by the acquirer absorbing (because SER is addressed to third parties). We have:

$$SER_{adj} = \left[ \frac{w_T}{w_A} (1 - a) \right]$$

Other possible adjustments are required in the presence of different types of shares denoting peculiar characteristics and prerogatives (an equivalent number of special shares must be converted into ordinary shares based on their respective market prices, if available). In this regard, Bertazzi & Bogarelli (2023) have interestingly investigated the impact and possible bias of the phenomenon of reciprocal ownership in the context of corporate valuations.

As stated, crucial and delicate is the choice of the methods by which determining  $W$  compliant to A and T company (ie, to their economic structure and performance). Fundamental principles are the consistency and the comparability of the valuation assumptions to be considered as intrinsic parts of a single/unitary valuation process (Guatri & Bini, 2021; Zanda, Lacchini, & Onesti, 2013; Massari, Villani, & Zanetti, 2022; Palea, 2001).

*THE INCOME METHOD.* It determines the share exchange ratio based on the earnings per share before the merger of the two parties assuming such multiples unchanged before and after the merger between the two parties.



$$SER = \frac{E_T}{E_A} * \frac{N_A}{N_T} = \frac{EPS_T}{EPS_A}$$

*THE MARKET PRICE METHOD.* It is based on the market price of each share before the merger between the two parties (MV is the market value and MPS is the market price per share; the method is highly suggested for listed companies).

$$SER = \frac{MV_T}{MV_A} * \frac{N_A}{N_T} = \frac{MPS_T}{MPS_A}$$

Often the market value is appraised by means of the P/E (price-earnings) multiple.

$$SER = \frac{P/E_T}{P/E_A} * \frac{E_T}{E_A} * \frac{N_A}{N_T} = \frac{MPS_T}{MPS_A}$$

*THE NET ASSETS METHOD.* It determines the share exchange ratio based on the net assets per share before the merger of the two parties (BVPS is the resulting book value per share).

$$SER = \frac{NAV_T}{NAV_A} * \frac{N_A}{N_T} = \frac{BVPS_T}{BVPS_A}$$

*ALTERNATIVE MODELS.* Alternative methods based on the performance of companies involved in a merger will take into account their Dividends, Cash Flows, and Operating results. In some cases, hybrid methods are used (excess earnings model).

The corporate valuations above are carried out from the stand-alone perspective and are neutral, relatively to the parties' interests. Nonetheless, both parties will accurately carry out their own arbitrage valuations in strategic key during the decision-making process.

Furthermore, we can easily argue that: company A will want to keep its own ratio ( $SER_{acq}$ ) as low as possible; company T will want its own ratio ( $SER_{targ}$ ) to be as high as possible; both companies would ensure that after the merger, their equivalent value per share will at least equal their pre-merger value per share.

The L-G model as also revisited by Conn and Nielsen (1977) proposed a maximum and a minimum SER to be determined respectively for the acquiring and the target firm, depending on the post-merger expectations of the combined firm and wealth constraints. Such a model utilizes the P/E multiple, but no business synergies, because the price-earnings multiple of the resulting company is just a weighted average of the price-earnings ratios of the two companies. The SER interval is then determined as follows under a market approach (where price  $P$  is a proxy of  $W$  of firms, and symbol C refers to the combined company):

$$\frac{P_T * N_T}{\left[\frac{P}{E}\right]_C * (E_A + E_T) - P_T * N_T} \leq SER \leq \frac{\left[\frac{P}{E}\right]_C * (E_A + E_T)}{P_A * N_T} - \frac{N_A}{N_T}$$

The more the actual SER (which can fluctuate between such boundaries) is close to the minimum limit, the more the gain for the acquirer, because the absorbing firm will have to give fewer shares in exchange (swap); the more it is close to the maximum limit, the more it will show the gain for the target, because its shareholders will get more shares in exchange (swap).

Here, a key (yet not easily predictable) variable is the P/E of the acquiring entity once the target is absorbed.

It is worth noting that SER valuation is a multiple issue in mergers by consolidations. If we assume that A and B will combine each other resulting in C, we have two relevant SERs (stand-alone perspectives, without synergy):

$$SER_A = \frac{W_A}{W_A + W_B} * \frac{N_C}{N_A} = \frac{w_A}{w_C}; \quad SER_B = \frac{W_B}{W_A + W_B} * \frac{N_C}{N_B} = \frac{w_B}{w_C}$$

In particular, the next section will show through an Income approach (intrinsic or dynamic approach) the introduction of synergy value inside the performance model both for absorptions and consolidations.

#### 4 – Plausible consideration of synergies. Alternatives and numerical examples

This time, with the purpose to analyze the wealth changes for target and acquirer shareholders under a performance (income) approach comprehensive of synergies, we let SER fluctuate between the following boundaries min and max:

$$\frac{EPS_T * N_A}{(E_A + E_T)(1 + s) - E_T} \leq SER \leq \frac{(E_A + E_T)(1 + s) - E_A}{EPS_A * N_T}$$

Where  $s$  is the synergistic rate of earnings growth. The model appears quite dependent on the EPS variable.

More complicated (but not impossible, if one only thinks of potential synergies emerging between the intangible assets or other strategic assets involved in the merger) can be the appraisal of synergies within the net asset valuation model or within the hybrid model.

*That said, we can identify a more general performance model determining SER (based on future economic streams like net incomes, dividends, or cash flows) which is able to consider in an explicit manner the synergy value, hence defining the maximum swap ratio for the acquirer and conversely the minimum swap ratio for the acquired entity. In such a dynamic framework, it is interesting to decline our assumptions concerning the synergy variable inside the ratio.*

First, to the acquirer shareholders, an increase in value will be if:

$$w_{A+T} \geq w_A$$

where  $w_{A+T}$  is the value per share after the merger including synergy (reflected by the wealth created by the differential flows  $W_d$ ) and  $w_A$  is the value per share without the merger (*ex-ante*). To calculate the maximum  $SER_{acq}$ , we have to posit  $w_{A+T} = w_A$ .

Hence:

$$w_{A+T} = \frac{W_A + W_T + W_d}{N_A + N_T * SER}$$

Then:

$$SER_{acq} (\max) = -\frac{N_A}{N_T} + \frac{W_{A+T}}{w_A * N_T} = -\frac{N_A}{N_T} + \frac{W_A + W_T + W_d}{w_A * N_T}$$

Which simply equals:



$$SER_{acq(max)} = \frac{W_{A+T} - W_A}{W_A} * \frac{N_A}{N_T} = \frac{W_T + W_d}{W_A} * \frac{N_A}{N_T}$$

Where, as known,  $W_{A+T} > W_A + W_T$  due to future synergies (expressed by  $W_d$ ) that will take place between A and T businesses.

For the opposite reason, the target shareholders will judge positively the merger if:

$$W_{A+T} \geq \frac{W_T}{SER}$$

Solving for SER, in a similar manner, as seen before, we obtain:

$$SER_{targ(min)} = \frac{W_T * N_A}{W_{A+T} - W_T} = \frac{W_T * N_A}{W_A + W_d}$$

Then:

$$SER_{targ(min)} = \frac{W_T}{W_{A+T} - W_T} * \frac{N_A}{N_T} = \frac{W_T}{W_A + W_d} * \frac{N_A}{N_T}$$

As said, corporate value (business wealth) is expressed with respect to performance flows, i.e., as a function of F:  $W=f(F)$ . Yet, the economic value of companies could be measured via net asset valuation. In such a case, the value of the net assets  $W(BV)$  combined could be higher than the sum of the parts involved in the merger because of higher value in use, fair value, tax saving, etc. Such incremental net asset value would be counted as  $W_d$ .

As obvious, the *actual* (i.e., effective) swap ratio will be included in our interval *min / max*:

$$SER_{targ(min)} \leq SER_{act} \leq SER_{acq(max)}$$

The distance between the actual value and the minimum will reveal the effective gain or premium recognized for the target:

$$Premium_{targ} = \frac{SER_{act} - SER_{targ(min)}}{SER_{targ(min)}} \%$$

The gap between the actual value and the maximum will reveal the actual gain or premium recognized for the acquirer:

$$Premium_{acq} = \frac{SER_{acq(max)} - SER_{act}}{SER_{acq(max)}} \%$$

Finally, it is interesting to decline the various hypotheses of attribution (or splitting) of the synergies in the business combination and in the SER formulas as a consequence.

In order to demonstrate the sensitivity of the exchange ratio when the possible synergic component changes, an example is used. For ease, let us assume the merger by absorption of company Theta into company Beta, where the latter does not hold any shares in the capital of the former. The following summary data are hypothesized.

- Theta: Stock capital = 100.000 cu; shares = 100.000; nominal value: 1 cu;  $W = 301.267$  cu.
- Beta: Stock capital = 120.000 cu; shares = 60.000; nominal value: 2 cu;  $W = 524.770$  cu.

- Synergy = 151.939 cu.

We could proceed (considering interlocking cases as follow):

a. without taking into account the merger synergy between Theta and Beta (that is the most accepted classical working hypothesis in business administration doctrine and practice);

b. by fully attributing the synergies either to Theta, the acquisition target (max SER), or to Beta, the absorbing company (min SER);

c. by sharing the synergies between Theta and Beta, based on the relative percentage weight on the economic value of the capital globally considered pre-synergy (ie, 36% + 64%);

d. by dividing the synergic value on a flat-rate basis (*forfait*) between the two companies (as in the so-called mergers of equals), 50% each.

Then we have the following results.

a. SER pure or stand-alone is calculated through the plain economic formula with no synergy.

$$\text{SER} = (W_T / N_T) / (W_B / N_B) = (301.267 / 100.000) / (524.770 / 60.000) = 3,01 / 8,75 = \mathbf{0,34}$$

(ie, 34/100)

b. SER with full synergy allocated to one party.

$$\text{SER}_{\max} = ((W_T + S) / N_T) / (W_B / N_B) = (453.206 / 100.000) / (524.770 / 60.000) = 4,53 / 8,75 = \mathbf{0,52}$$

(ie, 52/100)

$$\text{SER}_{\min} = (W_T / N_T) / ((W_B + S) / N_B) = (301.267 / 100.000) / (676.709 / 60.000) = 3,01 / 11,28 = \mathbf{0,27}$$

(ie, 27/100)

c. SER with divided synergies, that is, by splitting S (synergy) in S' attributable to the target contribution and S''=S-S' to the acquirer contribution.

$$\text{SER}_{\text{acq view}} = ((W_T + S') / N_T) / (W_B / N_B) = (355.965 / 100.000) / (524.770 / 60.000) = 3,56 / 8,75 = \mathbf{0,41}$$

(ie, 41/100)

$$\text{SER}_{\text{targ view}} = (W_T / N_T) / ((W_B + S'') / N_B) = (301.267 / 100.000) / (622.011 / 60.000) = 3,01 / 10,37 = \mathbf{0,29}$$

(ie, 29/100)

d. SER with 50% synergies allocated to both parties.

$$\text{SER}_{\text{acq view}} = ((W_T + S/2) / N_T) / (W_B / N_B) = (377.237 / 100.000) / (524.770 / 60.000) = 3,77 / 8,75 = \mathbf{0,43}$$

(ie, 43/100)

$$\text{SER}_{\text{targ view}} = (W_T / N_T) / ((W_B + S/2) / N_B) = (301.267 / 100.000) / (600.739 / 60.000) = 3,01 / 10,01 = \mathbf{0,30}$$

(ie, 30/100)

We can conclude that the two SERs, respectively from the acquirer's and target's points of view, can be expressed through general formulas corrected with coefficients  $\tau$  and  $\beta$  (between 0 and 1).

$$\text{SER}_{\text{acq view}} = [(W_T + \tau S) / N_T] / (W_B / N_B)$$

$$SER_{\text{targ view}} = (W_T / N_T) / [(W_B + \beta S) / N_B]$$

At the equilibrium point ( $\tau = \beta = 0$ ), both groups of shareholders (i.e., acquirer's and target's ownership) will gain some benefit (based on the distance between the plain SER and the respective boundary SER), even if no synergy is formally considered in the SER.

Instead, when  $\tau$  and  $\beta$  are 1, the NPV (net present value) respectively to the acquirer and the target shareholders, is zero.

We have taken into account separate SERs associated with Beta and Theta in our example. However, under a strategic framework of unitary analysis where the acquirer and target perspectives are 'merged', summary or matching values ( $SER_{\text{match}}$ ) can be identified for the various cases described as follow.

a.  $SER_{\text{match}} = SER_{\text{no synergy}}$  for both parties =  $(W_T / N_T) / (W_B / N_B) = (301.267 / 100.000) / (524.770 / 60.000) = 3,01 / 8,75 = \mathbf{0,34}$  (ie, 34/100)

b.  $SER_{\text{match}} = SER_{\text{full synergy(mean)}}$  : no formal intersection is possible in this case between 0,52  $SER_{\text{max}}$  and 0,27  $SER_{\text{min}}$  (anyway it could be selected the mean value  $\mathbf{0,40}$ , ie 40/100)

c.  $SER_{\text{match}} = SER_{\text{split syn}} = ((W_T + S') / N_T) / ((W_B + S'') / N_B) = (355.965 / 100.000) / (622.011 / 60.000) = 3,56 / 10,37 = \mathbf{0,34}$  (ie, 34/100)

where  $S' + S'' = S$

d.  $SER_{\text{match}} = SER_{\text{syn forfait}} = ((W_T + S/2) / N_T) / (W_B + S/2) / N_B = (377.237 / 100.000) / (600.739 / 60.000) = 3,77 / 10,01 = \mathbf{0,38}$  (ie, 38/100)

Definitely, we can state in one:

$$SER_{\text{match}} = [(W_{\text{Target}} + \tau^* S) / N_{\text{Target}}] / [(W_{\text{Bidder}} + \beta^* S) / N_{\text{Bidder}}]$$

where, rationally (in the presence of symmetric information (Dionne et al., 2015) between the parties, which is vital for a rational splitting) will be that:  $\tau^* S + \beta^* S = S$ .

Moving on to the special category (quite rare) of consolidation mergers and relating determination of SERs, we can utilize the same data as before, this time assuming that Theta and Beta companies are going to cease and form a new company, Gamma.

In brief, we have the following interlocking cases (a, b, c, d), noticing that with amalgamations both the Theta and Beta shareholders will need their own shares to be exchanged obtaining a certain number of new Gamma shares issued through a correct determination of  $SER_{\text{theta}}$  and  $SER_{\text{beta}}$ .

a. SERs pure or stand-alone are both calculated through the plain economic formula with no synergy.

$$SER_{\text{theta plain}} = [W_{\text{theta}} / (W_{\text{beta}} + W_{\text{theta}})] \times (N_{\text{gamma}} / N_{\text{theta}}) = (301.267 / 826.037) \times (220.000 / 100.000) = 36\% \times 2,20 = \mathbf{0,80}$$
 (ie, 80/100)

$$SER_{\text{beta plain}} = [W_{\text{beta}} / (W_{\text{beta}} + W_{\text{theta}})] \times (N_{\text{gamma}} / N_{\text{beta}}) = (524.770 / 826.037) \times (220.000 / 60.000) = 64\% \times 3,67 = \mathbf{2,35}$$
 (ie, 235/100)

b. SERs with full synergy to one party.

$$SER_{\theta \max} = [(W_{\theta} + S) / (W_{\theta} + W_{\beta} + S)] \times (N_{\gamma} / N_{\theta}) = (453.206 / 977.976) \times (220.000 / 100.000) = 46\% \times 2,20 = \mathbf{1,02} \text{ (ie, } 102/100)$$

$$SER_{\beta \text{ a-syn}} = [W_{\beta} / (W_{\theta} + W_{\beta} + S)] \times (N_{\gamma} / N_{\beta}) = (524.770 / 977.976) \times (220.000 / 60.000) = 54\% \times 3,67 = \mathbf{1,98} \text{ (ie, } 198/100)$$

or alternatively,

$$SER_{\beta \max} = [(W_{\beta} + S) / (W_{\theta} + W_{\beta} + S)] \times (N_{\gamma} / N_{\beta}) = (676.709 / 977.976) \times (220.000 / 60.000) = 69\% \times 3,67 = \mathbf{2,53} \text{ (ie, } 253/100)$$

$$SER_{\theta \text{ a-syn}} = [W_{\theta} / (W_{\theta} + W_{\beta} + S)] \times (N_{\gamma} / N_{\theta}) = (524.770 / 826.037) \times (220.000 / 100.000) = 31\% \times 2,20 = \mathbf{0,68} \text{ (ie, } 68/100)$$

c. SER with shared synergies, that is, by splitting S (synergy) in S' attributable to Theta contribution and S''=S-S' to Beta contribution.

$$SER_{\theta \text{ split syn}} = [(W_{\theta} + S W_{\theta} / (W_{\beta} + W_{\theta})) / (W_{\beta} + W_{\theta} + S)] \times (N_{\gamma} / N_{\theta}) = ((301.267 + 36\% 151.939) / 977.976) \times (220.000 / 100.000) = 36\% \times 2,20 = \mathbf{0,80} \text{ (ie, } 80/100)$$

$$SER_{\beta \text{ split syn}} = [(W_{\beta} + S W_{\beta} / (W_{\beta} + W_{\theta})) / (W_{\beta} + W_{\theta} + S)] \times (N_{\gamma} / N_{\beta}) = ((524.770 + 64\% 151.939) / 977.976) \times (220.000 / 60.000) = 64\% \times 3,67 = \mathbf{2,35} \text{ (ie, } 235/100)$$

d. SER with 50% synergies for both parties.

$$SER_{\theta \text{ syn/2}} = [(W_{\theta} + S/2) / (W_{\theta} + W_{\beta} + S)] \times (N_{\gamma} / N_{\theta}) = ((301.267 + 50\% 151.939) / 977.976) \times (220.000 / 100.000) = 39\% \times 2,20 = \mathbf{0,85} \text{ (ie, } 85/100)$$

$$SER_{\beta \text{ syn/2}} = [(W_{\beta} + S/2) / (W_{\theta} + W_{\beta} + S)] \times (N_{\gamma} / N_{\beta}) = ((524.770 + 50\% 151.939) / 977.976) \times (220.000 / 60.000) = 61\% \times 3,67 = \mathbf{2,24} \text{ (ie, } 224/100)$$

We can conclude that the two SERs, respectively from the Beta's and Theta's points of view, can be expressed, can be synthesized as follows:

$$SER_{\theta \text{ split syn}} = [(W_{\theta} + \tau S) / (W_{\theta} + W_{\beta} + S)] \times (N_{\gamma} / N_{\theta})$$

$$SER_{\beta \text{ split syn}} = [(W_{\beta} + \beta S) / (W_{\theta} + W_{\beta} + S)] \times (N_{\gamma} / N_{\beta})$$

Where  $\tau S + \beta S = S$  created through the business combination.

Consolidations may be mergers of equals when businesses have similar economic size; nonetheless, when the wealth of one company (its W) is much larger than the other company, the former can be identified as the acquirer entity (as such will have more stocks and management powers) and the latter as the target entity. Synergies can be split taking into account such aspects.

## 5 – Discussion and Conclusions

Despite its importance, the problem of the fair determination of the exchange ratio is largely unexplored in financial literature, especially as regards the value of synergy attributable to the

entities involved in a merger, since subjective evaluations enter the determination field based on the companies' financial reports data and planned performance for future (Moretto and Rossi, 2008). Nevertheless, it is an effort that should be made to represent and better understand the strategic dimension that dominates the merger / consolidation design, negotiation, and execution. Often the swap ratio being considered is determined in simple manner, that is, by adopting the stand-alone perspective for both companies (plain SER), also because – it is argued – absolute valuations of firms are not fundamental in mergers. In this context, the article tried to fill a gap in the literature by exposing an in-depth analysis of the possible role of the synergistic value inside the merger and consolidation swap, thus identifying a range of swap ratios to be included between the two boundary values: the maximum SER (in which all the expected synergy is attributed to the acquired entity) and the minimum SER (where all the expected synergy is attributed to the acquiring entity). The actual SER will fall within that interval, and the relative distance from the boundaries will express the actual gain for each party involved in the merger.

Since the returns to acquiring companies' shareholders are inversely related to market optimism at the time of mergers (Gugler et al., 2012), in periods of crisis (as the ones recently experienced) where trust is poor, we believe it is reasonable for the swap ratio to be driven by a partial contribution of synergies. Furthermore, the literature agrees in finding positive abnormal returns for the shareholders of the target company, while it disagrees on the effects of mergers on the shareholders of the acquiring company (in optimistic periods, the returns of the acquirers usually decrease due to overvaluation, sometimes even becoming negative). In general, empirical results show that there is no conclusive evidence that acquirers derive substantial benefits from mergers, which instead result in significant gains for the shareholders of the target company, e.g. Andrade et al. (2001); Weber (2013). The recognition of full synergy to the target through the maximum SER will further increase such disparity.

We have indicated different ways to split the synergies and reconcile them in one synthesis formula:

$$SER_{match} = [(W_{Target} + \tau^* S) / N_{Target}] / [(W_{Bidder} + \beta^* S) / N_{Bidder}].$$

Only if synergy is calculated as a fixed growth rate of the combined wealth  $s$  (%), such determination can be reduced to the plain basic formula without synergy:

$$SER_{match} = (W_{Target} (1+s) / N_{Target}) / (W_{Bidder} (1+s) / N_{Bidder}) = (W_{Target} / N_{Target}) / (W_{Bidder} / N_{Bidder})$$

In all other cases, studying the actual and specific performance and structure of the entities involved in the merger / consolidation, results will be differentiated. Essential is the possibility that the parties involved are willing to share information with each other on the present structure and planned performance of the business. Furthermore, the disclosure of the value recognized to the expected synergies at the time of a merger will support the market valuation during the period following the merger announcement, offsetting the value erosion due to investors' reaction to uncertainty.

Similar reflections are valid for demergers, since, in that case as well, one company will absorb another business and exchange stocks through the appropriate swap ratio.

The limitation of the study lies in the acknowledgment that other factors may influence the SER range (besides the issue of the irrationality of choices). Regarding our splitting, for example,

we have postulated the existence of divisible synergies. However, the presence of indivisible synergies (attributable only to the acquirer, excluding the target company's shareholders, unless they are enabled to contribute to future management) would have a special effect: further increasing the maximum SER and placing the minimum SER at the basic plain SER. The presence of indivisible synergies for both parties can be typical of joint ventures and mergers of equals. Furthermore, the valuation framework could be integrated through the real options approach to synergies (potential real options in mergers: growth options; exit options; options to postpone or abandon an investment; flexibility option - as change operating scale; switch option); Bruner and Perella (2004). Finally, a success coefficient could be introduced because the predicted synergies sometimes fail to materialize. Ficery et al. (2007), in this regard, indicated the most common mistakes that executives make in the forecast: defining synergies too narrowly or broadly; missing the window of opportunity; incorrect or insufficient use of incentives; lacking the right people involved in synergy capture; the mismatch between culture and systems; using the wrong process. In fact, the literature explains the failure of deals due to a false evaluation of potential synergies when firms merge (Roll, 1986; Sirower, 1997; Homberg et al., 2009).

In perspective, also considering the aforementioned critical considerations and limitations, a future line of empirical research could examine, through the analysis of case studies or statistical data, the actual role of the synergy variable within the SER in order to identify the most recurring allocation model, as well as the links between the SER and the actual value creation post-M&A in terms of effectiveness.

In addition, the consideration of synergies in the valuation process and negotiation is consistent with subsequent stages of accounting and financial reporting. In fact, IFRS 3 - Business Combinations recognizes the synergistic value as a core component of goodwill, as evidenced in merger and acquisition transactions (Jensen & Ruback, 1983). Therefore, future research could develop the SER value relevance in terms of market value and investigate, as well, the concrete allocation of the accounting excess of the new shares issued value over the book value of capital acquired.

As for the vital choice of the most suitable method for corporate valuation in mergers and acquisitions, we emphasize that the Covid-19 pandemic crisis (or other similar extraordinary circumstances that can occur) and the resulting market fluctuations have served as a warning regarding an exclusively market-oriented SER (based on P/E), instead suggesting a normalized income or cash flow analysis. Although crises temporarily slow down the waves of mergers and acquisitions, in strategic management thought synergy (Garzella and Fiorentino, 2014; Kengelbach et al., 2020) is still an effective means to overcome corporate crises and address the value creation (or preservation) challenge (Sudarsanam, 2003).

## 6 – References

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