

## Company valuation methods: applying dynamic analogical-stock market valuation models to agrarian co-operatives

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### Abstract

Agrarian co-operatives, in contrast to limited companies, cannot be listed on the Stock Market. Therefore, there is no mechanism such as the Stock Exchange rate to assign them a value. To correct this situation an analogical-stock market valuation model has emerged, which postulates that general markets behave as organized stock markets. The main consequence of this is the possibility of employing stock market information (generally more abundant and of higher quality than those from non stock-exchange companies) to value those which are not listed on the Stock Market, although by their nature they could be, or those which by their legal nature could never be quoted, such as the agrarian co-operatives. In the present work this methodology, specifically dynamic models, is applied to the valuation of wine co-operatives within the Appellation of Origin Alicante (Spain), calculating also the complementary merger value, trying to judge the convenience of an hypothetical association among them.

**Key words:** complementary merger value, Appellation of Origin Alicante, wine cellars.

### Resumen

#### Los modelos de valoración de empresas: aplicación de los modelos dinámicos de valoración analógico-bursátil a las cooperativas agrarias

Las cooperativas agrarias, al contrario que las sociedades anónimas, no tienen la posibilidad de cotizar en Bolsa. Por tanto, no existe un mecanismo como sería el Mercado de Valores que les asigne un valor. Para paliar esta deficiencia surge la valoración analógico-bursátil, que postula que el mercado general de empresas se comporta de manera análoga a los mercados de acciones organizados. La consecuencia más importante que se puede extraer es la posibilidad de emplear la información del mercado bursátil (que naturalmente es de una abundancia y calidad mayores que el de las empresas no cotizadas) para valorar empresas que no cotizan en la Bolsa de Valores, aunque por su naturaleza así pudieran hacerlo o también para valorar empresas que nunca podrían cotizar en Bolsa porque su naturaleza jurídica así se lo impide, tal es el caso de las cooperativas agrarias. En el presente trabajo se aplica esta metodología, específicamente los modelos dinámicos, a la valoración de las bodegas cooperativas amparadas por la Denominación de Origen Alicante (España), calculando también su valor complementario de fusión, en un intento de juzgar la conveniencia de una hipotética unión entre las mismas.

**Palabras clave:** valor complementario de fusión, Denominación de Origen Alicante, bodegas.

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### Introduction

Several methods can be used when we have to value an asset or company: firstly, those based on accounting information; secondly, those based on investment analysis; thirdly, econometric techniques, etc. We can underline valuation methods

based on analogical-stock exchange information among the last ones (Caballer, 1994; Moya, 1994; Caballer and Moya, 1997; Sales, 2000).

Company valuation methods that use data from Accountancy have their roots in calculating the patrimonial value as a difference between Assets and Liabilities. However, we must remember that this accounting value is not a good estimator of market value (Caballer, 1994).

Methods based on investment analysis (capitalization value, present value or yield value) can be

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good estimators of the market value if we locate the decision making process about investments in an efficient market environment. So, to estimate the year free cash flows, and their predictable evolution for relatively short periods of time, is not a difficult task if we know the Profit and Loss Account and the company's plans for the future. Nevertheless, it has to be noted that we are dealing with a prediction for the future and we must accept some hypotheses which are impossible to be proved in the present. The use of these models, as CAPM (*Capital Assets Price Model*) or APT (*Arbitrage Pricing Theory*), is not supported by the empiric evidence (Fama and French, 1992). Moreover, other authors have shown the inconsistency of the Beta calculation (Ballarin *et al.*, 1994).

Otherwise, the use of concepts related to value creation for shareholders, as EVA (*Economic Value Added*), Economic Profit and MVA (*Market Value Added*) will present the same problems that the cash flows discount (Sales, 2000).

The updating index estimation implies a much more difficult task, due to the fact that the financial market as a whole does not behave in an efficient way. Moreover, investments whose updating index is known are not homogeneous. This leads us to the possibility of electing this updating index among a relatively large set of values. This makes the final result very sensitive. Something very similar happens when we decide the investment term. This decision becomes harder and harder due to the technological updating. The updating index has to be chosen by comparing with other investments and the term must be fixed among several possibilities without rigorous criteria to do it (Caballer and Moya, 1998).

As it has been said before, classic valuation methods arrive to expressions as  $V = aX$ , where  $X$  is a variable linked to the yield. This expression could also be obtained through regression methods, it would be enough to choose the appropriate variable and to adjust a regression which goes through the coordinate's origin. But if more variables are employed (as long as they are not correlated among them), and the equation is provided with an independent term (multivariate models), a model will be obtained with a higher explanatory power and a higher likelihood (bearing in mind, for instance, the existence of no profit or although a negative one, does not mean a null or negative valuation of the company).

Thus, regression methods try to estimate variable behaviour, and market value as a mathematical function of other explanatory variables. If variables have correctly been chosen, and functions are adequate to explain the relationship between the market value variable and those treated as explanatory variables, the application of these econometric methods depends on the existence of a business transaction database. The lack of broad enough databases is the biggest difficulty for applying these methods, due to the fact that the number of business transactions is not very high and data are not systematically recorded (Sales, 2000).

The analogical-stock exchange method has been formulated and developed in order to overcome the lack of databases and be in the position to apply this methodology with a minimal operating level. This valuation method needs the acceptance of three hypotheses (Caballer and Moya, 1997):

- The stock exchange company value, as the sum of each type of company stock quotation multiplied by their number, is a company market value estimator.

- The stock exchange value or market value, if we accept the first hypothesis, can be explained as an endogenous variable starting from the companies economical and financial features (explanatory variables in regression models).

- The companies market is similar to stock exchange market.

This methodology, that has been used before in different sectors: banks (Moya, 1996; Caballer *et al.*, 1998), energy (Caballer and Moya, 1995) and agrifood companies (Moya and Oltra, 1993; Caballer and Moya, 1998; Sales, 2002), has two main advantages: it is simple and its hypotheses are more consistent than others. Moreover it allows one to value co-operative companies in a similar way with other companies for which we have enough information. This partly overlooks the problem of the lack of tools to analyse the behaviour of these associative companies, which due to their legal typology cannot act in the stock exchange market.

One objective of this paper is to obtain a global value for the wine co-operatives within the Appellation of Origin Alicante, one of the 60 wine Spanish Appellations of Origin (D.O.). It comprises 14,254 ha, 3,134 wine farmers and production of 112,463 hl in 2002-2003 campaign (about a 2% of national figures). The D.O. Alicante gathers 15

first tier wine producer co-operatives, that suppose the 99% of the winegrowers and more than 97% of the area and production of this D.O. Two thirds of the commercialized volume goes to the Spanish market (with a 34% sales increase in the last decade). The rest is exported, mainly to the European Union (with a 61% sales increase in the same period). The sales are composed of: 78% red wine, 10% white wine, 9% rosé wine, and the rest is brandy (Martínez-Carrasco, 2002).

It must be remarked that at the present time exists in the D.O. Alicante a second tier commercialization co-operative, *Bodegas Cooperativas de la Provincia de Alicante* (BOCOPA), constituted by eight first tier co-operatives, which gather around the 60% in number of winegrowers as well as in area and production volume.

Other objective is to calculate a merger value of D.O. co-operatives, trying to judge the convenience of an hypothetic association among them. A co-operatives complementary merger is also calculated, as the difference between the stock exchange value of the company that would result from an hypothetical merger of these co-operatives and the sum of co-operatives individual values.

## Material and Methods

Opposite to static analogical-stock exchange valuation models (Caballer, 1994; Caballer and Moya, 1997; Caballer *et al.*, 1998), this work has opted to use a dynamic valuation model that allows us to relate the stock exchange value with economic-financial variables of the analyzed companies and also with external indexes that validate these equations for different periods of time.

A diagonal analysis of agrifood companies quoted in the Spanish Stock Market has been carried out. For this purpose, we used the average stock market for the last term of each year, economic-financial variables and the average Madrid Stock Exchange Food Sector Index (IABM) for the last term. This work embraces an eight year period (1994-2001). A company with data for all the period is considered as eight different companies in order to get a higher effectiveness in the calculation process.

In this way, a regression equation is estimated where business stock value is explained through

economic-financial variables and IABM. So, it is possible to introduce data from any company (although it is not a quoted company) and get its analogical-stock value. The sole condition is the economic and financial structure homogeneity between the company to value and the companies that are analysed (Sales, 2000).

So, with only a regression we would have calculated the stock exchange value for any company, in any last year, and we could make a future forecast, only by replacing the expect value of this index in the resultant equation. Thus, and always that exist the homogeneity conditions in the economic-financial structure, we can value in the present and/or in the future any agrifood company, although it does not quote in the Stock Market.

We have opted for the Stock Exchange Food Sector Index as explanatory variable, instead of other variables that have influence in the company stock exchange value, as interest rate, inflation rate or GNP growth, because this index also gather these variables, and it displays a very high correlation with all of them: -82% and -75,7% with three years bonds yield and Madrid Interbank Offered Rate (MIBOR), respectively (Sales, 2000).

General dynamic valuation model used, calculated using information about agrifood companies quoted in the Spanish stock exchange market during the period 1994 – 2001, is the following:

$$V_B = b_0 f_0 (I_a) + b_1 f_1 (I_a)X_1 + \dots + b_n f_n (I_a) X_n + e \quad (1)$$

where:

$V_B$  = mean stock exchange value for the last year term

$b_i$  = regression coefficients

$f_i (I_a)$  = functions of Madrid Stock Exchange Food Sector Index

$X_i$  = model explanatory variables

$e$  = error term

One of the obstacles that the model must overcome is the interdependency among explanatory variables. This complicates the empirical determination of the variable contribution to the observed stock exchange value variation. In order to avoid this problem we must comply with the following steps. Firstly we observe the correlation level among explanatory variables related to the market value variable ( $V_B$ ) in a correlation matrix. Secondly a principal components factor analysis is done with the purpose of obtaining the



**Table 4.** Rescaled component matrix for explanatory variables of Madrid Stock Exchange Food Sector Index companies

	Factors			
	1	2	3	4
AT	0.969	-0.024	0.026	0.060
RPERM	0.964	0.019	0.015	0.018
RP	0.962	0.045	0.075	0.029
IN	0.957	-0.067	0.032	0.090
BB	0.928	0.142	0.150	-0.167
CF	0.924	0.135	0.187	-0.174
VA	0.920	-0.050	0.202	0.000
BN	0.911	0.195	0.160	-0.185
F	0.859	-0.014	0.352	-0.125
GF	0.640	-0.273	-0.110	0.519
AU	0.003	0.858	0.134	0.002
RPA	-0.159	0.806	-0.118	0.172
BBAT	0.142	0.720	0.081	-0.312
BNRP	0.091	0.598	-0.040	0.001
VAT	0.209	0.044	0.876	-0.074
RAI	0.132	0.106	0.841	-0.227
VAF	-0.151	0.107	-0.699	-0.206
GFE	-0.195	0.046	-0.045	0.861

In order to avoid this problem, a principal components factor analysis is developed (Table 4). This analysis, considering an eigenvalue higher than unit, reduce the 18 initial variables to four principal factors that explain the 80% of total variance (Table 5).

Factor 1 contains only variables in absolute value, which are referred to company size (AT, IN), capital requirements (RP, RPERM) and gain (F, BB, BN, etc.). Factor 2 is referred to equity weight and the company economic-financial profitability (BBAT and BNRP), all of them ratio variables.

**Table 5.** Factor analysis variance explained for Madrid Stock Exchange Food Sector Index companies

Factors	Extraction sums of squared loadings		
	Total	% of variance	Cumulative %
Factor 1 (F <sub>1</sub> ): AT, RPERM, RP, IN, BB, CF, VA, BN, F, GF	8.256	45.868	45.868
Factor 2 (F <sub>2</sub> ): AU, RPA, BBAT, BNRP	2.450	13.610	59.478
Factor 3 (F <sub>3</sub> ): VAT, RAI, VAF	2.308	12.824	72.302
Factor 4 (F <sub>4</sub> ): GFE	1.366	7.587	79.889

**Table 6.** Total Asset (AT) cluster analysis for Madrid Stock Exchange Food Sector Index companies. Cluster final centre

	Cluster	
	1 (120 companies)	2 (78 companies)
Ln AT	5.55	3.56

Factor 3 represents the efficiency in entrepreneurial management (VAT, RAI or VAF), while Factor 4 is referred to financial costs (GFE), both ratio variables too.

In factorial regression, explanatory variables are the components that have been extracted in the previous factor analysis (t-statistics are in parenthesis):

$$V_B = 236.835 + 423.134 F_1 + 24.913 F_2 + (12.087) (21.539) (1.268) + 76.418 F_3 - 103.747 F_4 \quad R^2 = 0.723 (3.890) (-5.281) \quad (2)$$

As can be noted from t-student values of previous expression, factors with higher explanatory loadings in stock market value calculation are Factor 1 (mainly in its size component), followed by Factor 4 and Factor 3 (referred to efficiency in entrepreneurial management).

In order to avoid homocedasticity, SEQC are separated to two groups through a cluster analysis. Total Asset Naperian logarithm is used as the variable because company size must be the separator between big and small companies. A logarithmic scale is employed to soften the scale change (Sales, 2000). The frontier between both groups is located around  $10^8$  € (Tables 6 and 7).

At this stage, definitive regressions are calculated for both groups of companies (SEQC) from the cluster analysis (Table 6); factors are substituted by variables (one per factor) with the highest correlation (thus multicollinearity is overcome). The following results are obtained for big companies [ $AT > 10^8$  €, (3)] and small companies [ $AT < 10^8$  €, (4)] (t-statistics are in parenthesis):

**Table 7.** ANOVA for AT cluster analysis for Madrid Stock Exchange Food Sector Index companies

	Cluster		Error		F	Sig.
	Mean square	df	Mean square	df		
Ln AT	182.764	1	0.493	196	370.041	0.000

**Table 8.** SEQC and co-operatives ANOVA results for RPA, VAT and GFA

		Sum of squares	df	Mean square	F	Sig.
RPA	Inter-groups	28,313.631	1	28,313.731	80.662	0.000
	Intra-groups	69,150.546	197	351.018		
	Total	97,464.177	198			
VAF	Inter-groups	44,815.622	1	44,815.622	153.641	0.000
	Intra-groups	57,463.127	197	291.691		
	Total	102,278.749	198			
GFE	Inter-groups	1,542.860	1	1,542.860	105.344	0.000
	Intra-groups	2,885.260	197	14.646		
	Total	4,428.122	198			

$$V_B = -198.335 + 0.003 I_a AT + 5.757 \cdot 10^{-8} I_a AT^2 + (-2.971) \quad (7.591) \quad (21.290) \quad (3) \\ + 0.824 VAT + 1.487 AU \quad R^2 = 0.937 \\ (3.780) \quad (2.012)$$

$$\ln V_B = -1.968 + 1.065 \ln AT + 0.002 I_a + (-7.763) \quad (31.631) \quad (5.849) \quad (4) \\ + 0.013 RPA + 0.008 VAF - 0.019 GFE \quad R^2 = 0.853 \\ (6.918) \quad (5.365) \quad (-2.436)$$

where:

$V_B$  = Stock exchange value ( $10^6$  €)

$AT$  = Total Assets ( $10^6$  €)

$VAT$  = Sales / Total Assets (%)

$AU$  = Equity/Long Term Assets (%)

$RPA$  = Equity/Total Assets (%)

$GFE$  = Financial Costs/Receivable Assets (%)

$I_a$  = Madrid Stock Exchange Food Sector Index

All wine co-operatives are considered small companies ( $AT < 10^8$  €), so regression (4) is used. Furthermore, we must analyse the existence of significant differences (ANOVA) between SEQC and these co-operatives, for RPA, VAF and GFE. There are significant differences for all of them, so they can not be used in the model (Table 8).

As we can't use previous variables, as they significantly differ between groups (SEQC and co-ope-

ratives), we must replace them by other variables of the same factor, which have not this problem. In our case, after some calculations, variables that comply with this condition and also show the best adjustment are:  $AU$  (Equity/Fixed Liability) from Factor 2 and  $VAT$  (Sales/Total Assets) from Factor 3 (ANOVA results that validate the choice of these variables are shown in Table 9). The regression equation that replace (4) expression is the following (it can be observed a minimum explanatory capability loss):

$$\ln V_B = -1.690 + 1.020 \ln AT + 0.002 I_a + (-6.688) \quad (28.783) \quad (6.220) \\ + 0.012 AU + 0.002 VAT \quad R^2 = 0.828 \quad (5) \\ (6.240) \quad (3.975)$$

where:

$V_B$  = Stock exchange value ( $10^6$  €)

$AT$  = Total Assets ( $10^6$  €)

$AU$  = Equity/Fixed Liability (%)

$VAT$  = Sales/Total Assets (%)

$I_a$  = Madrid Stock Exchange Food Sector Index

## Results

In Table 10 we can see the analogical-stock exchange value evolution for D.O. Alicante co-ope-

**Table 9.** SEQC and co-operatives ANOVA results for AU and VAT

		Sum of squares	df	Mean square	F	Sig.
AU	Inter-groups	774.315	1	774.315	0.690	0.407
	Intra-groups	221,219.968	197	1,122.944		
	Total	221,994.283	198			
VAT	Inter-groups	3,939.565	1	3,939.565	0.866	0.353
	Intra-groups	896,429.588	197	4,550.404		
	Total	900,369.153	198			

**Table 10.** Analogical-stock exchange value evolution for D.O. Alicante co-operatives from 1994 to 2001 ( $10^6$  €)

Co-ops	1994	1995	1996	1997	1998	1999	2000	2001
1	0.469	0.522	0.547	0.956	1.292	1.322	1.703	1.456
2	0.089	0.137	0.117	0.183	0.369	0.433	0.365	0.335
3	0.566	0.505	0.563	0.854	1.333	1.455	1.441	1.454
4	0.024	0.038	0.039	0.099	0.233	0.328	0.388	0.390
5	0.513	0.542	0.537	0.275	0.695	1.304	1.575	1.464
6	0.869	0.514	0.376	2.338	2.215	1.869	4.075	3.018
7	0.187	0.162	0.209	0.488	0.690	0.819	0.557	0.825
8	0.723	0.834	0.717	1.025	1.367	1.521	1.305	1.231
9	0.834	0.977	1.152	1.257	2.047	2.610	1.930	0.789
10	1.153	1.194	1.352	1.941	3.485	4.538	4.429	3.924
11	0.305	0.776	0.670	0.457	1.632	0.444	0.731	0.674
12	0.272	0.266	0.165	0.366	0.534	0.667	0.493	0.434
13	0.151	0.168	0.199	0.293	0.471	0.557	0.610	0.549
14	0.546	0.435	0.394	0.929	1.527	0.956	0.767	0.871
15	0.511	0.538	0.536	0.704	1.133	1.615	1.397	1.770
Total co-ops value	7.212	7.608	7.573	12.165	19.023	20.438	21.766	19.184

ratives from 1994 to 2001, as well as a total yearly value work out as the sum of all co-operatives value. We can appreciate the significant increase of these values during the last eight years.

Table 11 shows the D.O. Alicante co-operatives complementary merger value from 1994 to 2001. This value is the difference between the stock exchange value of the company that would result from an hypothetical merger of these co-operatives and the sum of co-operatives individual values (Table 10). This concept is important in order to know if value is created or destroyed in the concentration process. In the case of the wine co-operatives of D.O. Alicante, complementary merger value is always positive (Table 11), with a signifi-

**Table 11.** Merger values for D.O. Alicante co-operatives from 1994 to 2001 ( $10^6$  €)

Year	Hypothetical co-operative merger value	Sum of co-operatives individual value	Complementary merger value
1994	9.765	7.211	2.553
1995	10.536	7.609	2.927
1996	10.044	7.574	2.470
1997	16.272	12.164	4.108
1998	25.265	19.023	6.242
1999	26.029	20.438	5.590
2000	28.301	21.765	6.536
2001	23.939	19.183	4.756

cant increase in the period too, which at first advice us a merger among them.

Other possibility in order to decide the merger suitability among companies is the use of Tobin's  $q$ , ratio that relate company market value (valued by  $V_B$ ) with a book value (usually a replacement cost, although in that case it is valued by co-operatives equities value). If the value of the  $q$  ratio is higher than unit this means value creation for the co-operative member, meanwhile values lower than unit mean value loss, because in that case market value is lower than its equity value. In our case, the calculated  $q$  value is not exactly de Tobin's  $q$  but an approach, where the replacement cost is replaced by the asset value. This value is always higher for an hypothetical co-operative merger than for the sum of co-operatives individually (Table 12). This difference (as a relative value) is other way to show the value creation that for members mean an hypothetical merger among these co-operatives.

If we draw the evolution of D.O. Alicante co-operatives value, as the sum of co-operatives individual value and as an hypothetical co-operative merger value, we can appreciate the similar performance of Madrid Stock Exchange Food Sector Index and these values (Figure 1).

Regarding complementary merger value, it can be observed how an hypothetical co-operatives merger has a higher value than first tier co-opera-

**Table 12.** Tobin's q for an hypothetical co-operatives merger and for the sum of individual co-operatives from 1994 to 2001 ( $10^6$  €)

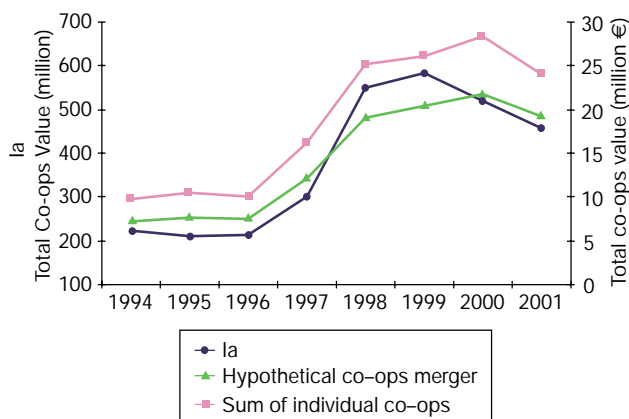
	1994	1995	1996	1997	1998	1999	2000	2001
Hypothetical co-ops merger	2.732	2.626	2.412	3.569	5.271	4.379	4.875	3.809
Sum of individual co-ops	2.018	1.897	1.819	2.668	3.969	3.439	3.749	3.053
$\Delta$ Value creation (%)	35.405	38.475	32.610	33.771	32.815	27.352	30.032	24.794

tives acting on their own (graphically it will be the area comprised between both co-operatives value lines from 1994 to 2001, Figure 1). This value has increased continuously during the first half of the period, fluctuating later around five million euros. By relative value, an hypothetical merger will mean a value creation with respect to the original situation around a 30% in the period (Table 12). This would prove the suitability, as far as value creation, of a merger process for D.O. Alicante first tier wine co-operatives.

However, as it has been said before, nowadays the chosen solution for one half of D.O. Alicante co-operatives, is not the merger among them, but also the joint commercialization of their production through a second tier commercialization co-operative (BOCOPA).

## Discussion

The dynamical analogical-stock exchange valuation model used in this paper allows us to calculate the D.O. Alicante co-operatives value (as sum of individual values), and also the value of an hypotheti-

**Figure 1.** Madrid Stock Exchange Food Sector Index (Ia) and D.O. Alicante analogical-stock exchange values evolution (1994-2001).

cal merger among them, from 1994 to 2001. Both values show a similar evolution to Madrid Stock Exchange Food Sector Index during this period.

Complementary merger value of wine co-operatives belonging to D.O. Alicante has been also calculated. This value, positive all the years, and with a significant increase in the period (either in absolute or relative value), would suggest the merger among them.

However, co-operatives do not merge, a theoretically profitable process, due to several reasons that this econometric model does not take into account. These reasons are not just social reasons (for example the farmer prefers his own village's co-operative; they are scared of losing something that they see as theirs). We must include other parameters such as the higher cost of transport to another village, and the scale facilities needed to accept a combined quantity of grapes and this could be unprofitable because of the tremendous seasonal variation of the product.

Mainly for these reasons, some of the co-operatives have chosen an intermediate solution, to create a second tier commercialization co-operative (BOCOPA). This allow members to benefit from the created added value by the second tier co-operative with smaller investments, taking profit of joint marketing advantages as well as production decentralisation advantages. This strategy chosen seems to partially satisfy these co-operatives expectations. However, this must be only the first step of a higher level integration process, judging by the complementary merger value obtained in this paper.

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