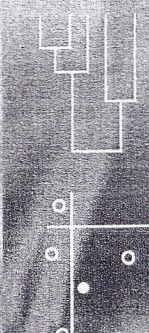


STUDIES IN CLASSIFICATION,
DATA ANALYSIS,
AND KNOWLEDGE ORGANIZATION

Classification and Multivariate Analysis for Complex Data Structures

Bernard Fichet
Domenico Piccolo
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Editors



Classification and Multivariate Analysis for Complex Data Structures

The growing capabilities in generating and collecting data has risen an urgent need of new techniques and tools in order to analyze, classify and summarize statistical information, as well as to discover and characterize trends, and to automatically bag anomalies. This volume provides the latest advances in data analysis methods for multidimensional data which can present a complex structure. The book offers a selection of papers presented at the first Joint Meeting of the Société Francophone de Classification and the Classification and Data Analysis Group of the Italian Statistical Society. Special attention is paid to new methodological contributions from both the theoretical and the applicative point of views, in the fields of Clustering, Classification, Time Series Analysis, Multidimensional Data Analysis, Knowledge Discovery from Large Datasets, Spatial Statistics.

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A Test of LBO Firms' Acquisition Rationale: The French Case

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Abstract We investigate whether the characteristics of Leveraged Buy-Out (LBO) targets before the deal differ from those of targets that have undergone another type of transfer of shares. Specifically, we examine the size, value, industry, quotation and profitability of French targets involved in transfers of shares between 1996 and 2004. Using two different methods (a classical logit regression and a mixed discriminant analysis), results show that LBO targets are more profitable, that they are more frequently unquoted, and that they more often belong to manufacturing industries in comparison with the targets involved in other types of transfers of shares.

1 Introduction

Leveraged Buy-Outs (LBO) are acquisitions of a significant equity stake of a company by private investors using additional debt financing. Since the evolution of the LBO as a common form of takeover of public or private firms in the 1980s, several companies, hereafter referred to as "LBO firms", specialized in making this type of investment with venture capital raised in the private equity market. This activity in France has experienced an extraordinary increase. From 1997 to 2006, the amounts invested in these transactions increased nine-fold, from 1.259 to 10.164 euro-billion [3].

France is a leader in the LBO market in continental Europe but it is still far behind the United Kingdom and the United States which are the focus of the vast majority of the academic literature (see [6] for a recent overview on LBOs). In this context, we investigate French LBOs in order to provide new evidence on the profile of LBO targets. We test a number of hypotheses derived from LBO firms' acquisition rationale that may explain the French LBO targets' underperformance after the transaction [7, 8, 15, 16]. This analysis allows us to check if LBO firms meet various financial criteria when evaluating an LBO target.

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2 Theoretical Predictions

To predict the types of targets that are likely to engage in LBOs, we present the specific criteria that are used by LBO firms in their acquisition rationale. LBO firms look for a variety of characteristics in potential investments and are, thus, similar in their basic criteria for takeovers candidates (e.g. mature industries, stable cash flows, low operational risk).

LBO firms generally have two objectives. They seek, first, to maximize their future capital gain from the sale of shares and, second, to minimize the risk of non-payment of the acquisition debt. LBOs create heavy leverage that may be inefficient for firms that expect unstable earnings or plan to engage in new projects. Moreover, heavy leverage may carry with it costs associated with an increased likelihood of insolvency. Since the company's cash flow is used to service the debt, "the most significant risk in an LBO is that the company will not achieve the cash flow necessary to service the large acquisition debt" [18]. Consequently, LBO firms and lenders are most interested in the target's future and past capacity to generate large and steady levels of cash flow. In France, Desbrières and Schatt [7] show that companies undergoing LBOs are the ones which have the greatest ability to remunerate the funds provided by investors and lenders. They find that acquired firms are more profitable than industry average prior to the LBO, which is consistent with the results of Singh [19].

Several characteristics make it possible to define an eligible target for LBO deals. A study by Cressy et al. [5] suggests that LBO firms' skill in investment selection and financial engineering techniques may play a more important role than managerial incentives in raising post LBO performance [11, 12]. A description of financial criteria used by LBO firms to evaluate potential targets follows.

First, one widely accepted conclusion is that the level of financial leverage a firm can bear is a function of its business risk. Business risk is one of the primary determinants of a firm's debt capacity and capital structure [14]. Firms with high degrees of business risk have less capacity to sustain high financial risk, and thus, can use less debt. Firms with risky income streams are less able to assume fixed charges in the form of debt service. Johnson [13] states that firms with more volatile earnings growth may experience more states where cash flows are too low for debt service. For this reason, LBO firms avoid investments in highly cyclical businesses since stability of earnings and cash flow is critical to the success of an LBO. The empirical data developed by Lehn and Poulsen [17] support this view as almost half of their sample of LBOs were in five industries (retailing, textiles, food processing, apparel, and bottled and canned soft drinks) that are all consumer nondurable goods industries for which the income elasticity of demand would be relatively low. Otherwise an LBO target's activity must not require heavy investments. In capital-intensive industries, relatively large amounts of tangible capital assets are required. During the LBO, new investments have to be limited. Moreover, the target expected growth has to be positive but not too high because a high growth rate would create high working capital requirements. The discussion here suggests the following alternative hypothesis. *The likelihood that a target is acquired through an LBO depends on its industry (H₁).*

We expect that LBOs are positively linked with mature and non-cyclical industries and negatively related to the target's industry capital intensity. In particular, we expect that transportation, warehousing and storage (called Transport) is negatively related to LBOs as this industry is cyclical (H_{1a}). On the contrary, wholesale and retail trade industry or hotels and restaurants are indeed cyclical sectors but they are characterized by a low capital intensity. We expect that they are positively linked with LBOs (H_{1b}). We expect that firms in high technology sectors related to LBOs as capital requirements and business risk are high in high-growth firms (H_{1c}). The situation of manufacturing industries is more ambiguous. They are typically very cyclical. But there are important differences among them in how they are affected by a downturn. For instance, the food manufacturing industry is non-cyclical. Otherwise they are rather mature so that growth rates and new investments are limited.

Second, the target profitability ought to be historically high and well controlled. Desbrières and Schatt [7] show that return on equity is higher for LBO targets two years before the deal, and that return on investment is greater two years before and the year preceding the deal. We thus propose the following alternative hypothesis. *The likelihood that a target is acquired through an LBO should be positively related to its profitability (H₂).* Third, only a handful of Public-to-Private transactions (PTP) are completed in France each year because of a number of issues, arising from French corporate ownership structure and legislation [14]. Consequently, the very great majority of French LBOs involve privately held, rather small companies. To test this idea, we propose the following alternative hypotheses. *The likelihood that a target is acquired through an LBO should be negatively related to its quotation on the stock exchange (H₃) and the likelihood that a target is acquired through an LBO should be negatively related to its size and value (H₄).*

3 Sample Selection and Methodology

To test the hypotheses we construct a buy-out sample and a control sample of non-LBO transfers of shares over the period 1996–2004. Our total sample is extracted from the Zephyr database published by Bureau Van Dijk. Since 1996, this database has collected information on various types of deals including mergers and acquisitions, initial public offerings (IPOs), joint ventures and private equity deals, with no minimum deal value. Information concerns the type of deals which can be mergers¹, acquisitions of majority interests (all cases in which the acquirer ends up with 50% or more of the votes of the target), transfers of minority stakes (below 50%), LBOs, or IPOs, which involve targets². Information also concerns the deal value and the deal financing and method of payment. Moreover, Zephyr collects information on the characteristics of each type of actors involved into the deals: targets, buyers and

¹ Mergers are business combinations in which the number of companies decreases after the transaction.

² Targets are companies being sold, or companies in which a stake is being sold.

sellers. Some variables are qualitative such as sector, quotation, country. Others are continuous such as firms' size and profitability.

In this database, we select all deals (3,495) corresponding to transfers of ownership rights which involve French targets and which were completed during the period January 1, 1996 – May 5, 2004. The availability of variables limits our sample size to 664 deals which are classified into two groups: LBOs (126 deals) *versus* non-LBOs (538 deals).

To test the hypotheses, we use then compare the results of two decision-making concurrent methods on mixed (qualitative and quantitative) predictors. We can also use decision tree method. The first method is a logistic model, run through SAS system, in which the endogenous variable is the LBO likelihood and the exogenous variables are the targets' characteristics. The second method is a mixed discriminant analysis (MDA) [1], run through SPAD system, which aims to differentiate the two groups of deals according to mixed characteristics of targets. It is a classical discriminant analysis [9, 10] carried out on the principal factors of a Mixed Principal Component Analysis of explanatory mixed variables [2]. Alternatively, the decision tree method could have been used.

The LBO likelihood is the variable we want to explain. The other variables characterize target companies. Some variables are continuous: deal value, target size (total assets and turnover) and target profitability (Return On Equity -ROE- and Return On Assets -ROA-). The deal date is taken into account by introducing a quantitative variable that represents the number of years between the deal date and 1996. The qualitative variables used are the target sector and quotation. The descriptive data of variables are presented in Tables 1 and 2.

Targets belong to different sectors. Among them, the sector of high technology is the most represented one (39.31%), followed by manufacturing industries (30.72%) and services (13.25%). Moreover, 65.36% of the deals (434) involve unquoted targets.

Table 1. Summary statistics of continuous variables

Variable	Label	Frequency	Mean	Std dev.	Min	Max
CDAT	Date (years)	657	3.478	1.668	1	8
DVAL	Deal value (Euro-Mil.)	664	115.382	561.214	0.018	7900.00
TTAS	Total assets (Euro-Mil.)	664	858.809	4516.230	0.025	53228.00
ROE	Return on equity	664	0.416	6.215	-38.320	136.05
ROA	Return on assets	664	-0.112	0.445	-3.030	0.73
TTUR	Turnover (Euro-Mil.)	664	692.874	3361.250	0.013	36351.00

Table 2. Descriptive statistics of qualitative variables

Variable modalities	Frequency	Percent	Cumulative frequency	Percent
LBO likelihood				
LBO	126	18.98	126	18.98
Non-LBO	538	81.02	664	100.00
Target sectors				
Construction	11	1.66	11	1.66
High-tech	261	39.31	272	40.96
Hotel-restaurant	7	1.05	279	42.02
Manufactured	204	30.72	483	72.74
Retail-wholesaling	59	8.89	542	81.63
Services	88	13.25	630	94.88
Transport	25	3.77	655	98.64
Utilities	9	1.36	664	100.00
Target quoted/unquoted				
Quoted	230	34.64	230	34.64
Unquoted	434	65.36	664	100.00

4 Empirical Results

With the logistic model, we find no significant link between the LBO likelihood and the deal value or the size of target, whatever may be the measure of size, total turnover or total assets. This result is not consistent with H4. This may be related to the Zephyr database coverage. The great majority of French LBOs involves privately held firms and Zephyr may cover mainly the largest deals with public information available. The significant explanatory variables of LBOs are: the target sector, quotation and ROA (Table 3). More precisely, the LBO likelihood is positively linked with ROA (consistent with H2) and with manufacturing industries and negatively linked with quotation (consistent with H3) and high technology (consistent with H1a and H1c).

With the mixed discriminant analysis method, results (Table 4) are very significant ($PROBA = 0.0001 < 5\%$). Among the introduced mixed variables, some results are the same as with the logistic regression. LBO targets exhibit higher ROA than other targets (consistent with H3). They are more frequently unquoted (consistent with H3) and belong to manufacturing industries. They belong less than the average to transport industries (consistent with H1a). With the mixed discriminant analysis, we find that LBO targets also exhibit higher ROE (consistent with H2) and belong more often to the sector of Retail and wholesaling (partially consistent with H1b). According to the mixed discriminant analysis and contrary to the logistic model, the high technology industry does not differentiate between the two groups of transfers of shares.

Table 3 Binary logistic model – SAS results

Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard error	Wald chi-Square	Pr > ChiSq
Intercept	1	-1.7206	0.3403	25.5619	<.0001
TZCL Construction	1	0.2514	0.6927	0.1317	0.7167
TZCL High-tech	1	-1.5692	0.3429	20.9396	<.0001**
TZCL Hotel-restaurant	1	0.6074	0.9715	0.3909	0.5318
TZCL Manufactured	1	0.5762	0.2711	4.5174	0.0336*
TZCL Retail-wholesaling	1	0.4191	0.3738	1.2573	0.2622
TZCL Services	1	-0.5872	0.3679	2.5482	0.1104
TZCL Transport	1	-0.6023	0.5460	1.2170	0.2699
TQUO Quoted	1	-1.1234	0.1677	44.8537	<.0001**
CDAT Code date	1	-0.0216	0.0670	0.1039	0.7471
DVAL Deal value (Millions)	1	0.000237	0.000236	1.0099	0.3149
TTAS Target total assets	1	0.000072	0.000162	0.1970	0.6571
ROE Return on equity	1	0.0609	0.0589	1.0688	0.3012
ROA Return on assets	1	2.6568	0.5975	19.7753	<.0001**
TFUR Target turnover	1	-0.00023	0.000227	1.0405	0.3077

** Significance less or equal than 1%; * Significance]1–5%]

Finally, when we compare the number of observations well classified (Table 5) with each method, we can conclude that the performances of the two methods are quite the same.

5 Discussion and Conclusion

This paper provides an empirical test of four hypotheses about private equity firms' acquisition rationale. The characteristics of companies undergoing LBO transactions have been extensively investigated within the US and the UK but not in continental Europe. This gap in the literature is critical for France as [7, 8, 15, 16] showed that the implications for French LBOs are unique (sources, targets' ex post performance, selection by LBO firms, etc.). Our study examines whether the characteristics of French LBO targets differ from those of firms that have been transferred through another type of deal.

To test the hypotheses we construct a buy-out sample and a control sample of non-LBO transfers of shares over the period 1996–2004. In the first method used, a classical logistic regression, we use a dummy variable to discriminate between the two groups of deals. To check the robustness of our results, we also use a second method, a mixed discriminant analysis which is, to our knowledge, new to the literature on private equity and LBOs.

Results confirm our main theoretical prediction according to which the characteristics of LBO targets differ significantly from the characteristics of other firms that have not been sold through an LBO. More precisely, results show, as expected, that LBO targets are more profitable [7, 8, 16], that they are more frequently unquoted,

Table 4 Mixed discriminant analysis – SPAD results

Fisher's Linear Function: Variables	Correlations Variables With D.L.F	Parameter Estimate		Standard Deviation (Res. Type Reg.)	T Value	Proba
		Discriminant Function	Regression			
Num Labels						
LBO						
6 Deal value (Millions)	-0.019	0.0001	0.0000	0.0001	0.54	0.588
10 Target total assets	-0.071	0.0001	0.0000	0.0000	0.72	0.473
11 ROE - Return on equity	0.066	0.0462	0.0141	0.0056	2.52	0.012*
12 ROA - Return on assets	0.197	1.3883	0.4243	0.0853	4.97	0.000**
17 Unquoted	0.240	0.0000	0.0000	0.0000	0.00	0.000**
19 Manufactured ind.	0.244	1.6090	0.4917	0.1895	2.59	0.010**
20 Construction	0.058	1.6514	0.5047	0.3246	1.55	0.120
21 Hotel and restaurant	0.025	1.6442	0.5025	0.3840	1.31	0.191
22 Retail-wholesaling	0.092	1.5460	0.4725	0.2145	2.20	0.028*
23 Services	-0.042	0.1503	0.0459	0.2028	0.23	0.821
24 Utilities	0.010	1.5741	0.4811	0.3584	1.34	0.180
25 Transport	-0.015	0.0001	0.0000	0.0001	0.00	0.000**
Non LBO						
5 Code date	0.016	-0.0073	-0.0022	0.0211	0.11	0.916
13 Target turnover (Millions)	-0.076	-0.0001	-0.0000	0.0000	1.24	0.214
16 Quoted	-0.240	-2.1927	-0.6701	0.0783	8.55	0.000**
18 High tech	-0.272	-0.6560	-0.2005	0.1893	1.06	0.290
INTERCEPT		-0.082825	0.151059	0.1985	0.7611	0.4469

** Significance less or equal than 1%; * Significance]1–5%]

Table 5 Comparison – Classification results

Number of Observations well classified into Group (Percent)				
Method	Training Sample (80%)		Test Sample (20%)	
	(Frequency : 664)	Total	(Frequency : 166)	Total
LOGISTIC	513(81.82%)	627*	121(81.76%)	148*
MDA	539(81.17%)	664	135(81.33%)	166

* Missing values

and that they more often belong to mature and rather non-cyclical industries [17]. Interestingly, we do not identify any sign of abnormality in the selection of French LBO targets by private equity firms over the period 1996–2004. Our results suggest that private equity firms behave in accordance with financial standards when they screen targets for LBO deals. This is not consistent with the study of [16], which finds an unexpected risky profile of French LBO targets. This is also not consistent with Wright et al. [20] who argue that, if we consider LBOs as a vehicle for strategic innovation and renewal that stimulates growth opportunities, then the need for a low business risk of LBO targets becomes less necessary, LBO firms seeking above all to realize entrepreneurial opportunities.

Finally, our analysis relies on data from a single country, France, where the private equity industry has already entered its maturity phase and LBO firms have had the opportunity to accumulate relevant experience. This raises concern about the generalizability of our results to other countries, in particular to those with significantly less developed private equity markets such as, for instance, Italy and Spain. Hence future research might examine and compare the selection of LBO targets in different European countries.

References

1. Abdesselam, R.: Discriminant analysis on mixed predictors. In: Lauro, C., Palumbo, F., Greenacre, M. (eds.) Book Series, Studies in Classification, Data Analysis, and Knowledge Organization, Data Analysis and Classification: From the Exploratory to the Confirmatory Approach. Springer, Heidelberg (2008)
2. Abdesselam, R.: Analyse en Composantes Principales Mixte. Classification: points de vue croisés, RNTI-C-2, Revue des Nouvelles Technologies de l'Information RNTI, Cepadués Editions, pp. 31–41 (2008)
3. AFIC: Rapport sur l'activité du capital investissement en France. <http://www.afic.asso.fr/> (2006)
4. AFIC: Le PtoP a-t-il un avenir en France? <http://www.afic.asso.fr/> (2004)
5. Cressy, R., Munari, F., Malipiero, A.: Playing to their strengths? Evidence that specialization in the private equity industry confers competitive advantage. *J. Corp. Finance* **13**, 647–669 (2007)
6. Cumming, D., Siegel, D.S., Wright, M.: Private equity, leveraged buyouts and governance. *J. Corp. Finance* **13**, 439–460 (2007)
7. Desbrières, P., Schatt, A.: The impacts of LBOs on the performance of acquired firms: the French case. *J. Bus. Finance Account.* **29**(5&6), 695–729 (2002)
8. Desbrières, P., Schatt, A.: L'incidence des LBO sur la politique d'investissement et la gestion opérationnelle des firmes acquises: le cas français. *Finance Contrôle Stratégie* **5**(4), 79–106 (2002)
9. Geoffrey, J. McLachlan: Discriminant Analysis and Data Statistical Pattern Recognition. Wiley-Interscience, New York, NY (2005)
10. Hand, D.: Discrimination and Classification. Wiley, New York, NY (1981)
11. Jensen, M.: Agency costs of free cash flow, corporate finance, and takeovers. *Am. Econ. Rev.* **76**(2), 323–329 (1986)
12. Jensen, M.: Eclipse of the public corporation. *Harv. Bus. Rev.* **67**(5), 61–74 (1989)
13. Johnson, S.: An empirical analysis of the determinants of corporate debt ownership structure. *J. Finance Quant. Anal.* **32**(1), 47–69 (1997)
14. Kale, J., Noe, T., Ramirez, G.: The effect of business risk on corporate capital structure: theory and evidence. *J. Finance* **46**(5), 1693–1715 (1991)
15. Lehn, K., Poulsen, A.: Leveraged buyouts: wealth created or wealth redistributed? In: Weidenbaum, M., Chilton, K. (eds.) Chapter 4 in Public Policy Towards Corporate Takeovers. Transaction Publishers, New Brunswick, NJ (1988)
16. Le Nadant, A.L.: La Performance des Sociétés Cibles dans les Opérations de LBO: Etude du Marché Français. *Anal. Finan.* **116**, 67–85 (1998)
17. Le Nadant, A.L., Perdreau, F.: Financial profile of leveraged buyout targets: some french evidence. *Rev. Account Finance* **5**(4), 370–392 (2006)
18. Maupin, R.: Financial and stock market variables as predictors of management buyouts. *Strateg. Manag. J.* **8**(4), 319–327 (1987)
19. Singh H.: Management buyouts: distinguishing characteristics and operating changes prior to public offering. *Strateg. Manag. J.* **11**(5), 111–129 (1990)
20. Wright, M., Hoskisson, R. E., Busenitz, L.W., Dial, J.: Finance and management buyouts: agency versus entrepreneurship perspectives. *Venture Cap.* **3**(3), 239–261 (2001)