An Adaptive Genetic Method Using Non Parametric Tests to Predict Corporate Financial Failure in Pakistan

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Abstract

The study is empirically estimating financial failure of textile sector of Pakistan by using accounting and macro-economic indicators. Random sampling is used for sample selection and textile sector bankrupt and listed companies are randomly obtained for empirical study. The results revealed that profitability, indebtedness, size, Cashflow, inflation, interest rate, government debt and other indicators predicting financial failure significantly. For this descriptive, Krusukall wald test, various percentile test are applied by using adaptive genetic methodology. The results are theoretically supporting random walk theory. The study faced data limitation and suggested to strengthen regulatory mechanism, controlling system and provide potential business opportunities.

Keywords: Financial Failure; Accounting; Economic; Pakistan; Random Sampling; Percentile.

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1. Introduction

Acquiring corporate success and financial growth financial development competencies are the necessary requirements for modern time's financial markets (Altman and Hotchikss, 1993). This is possible by avoiding, diversifying or mitigating corporate financial failure (Dambolena and Khoury, 1980). Recently, a special attention is given to corporate financial failure around the world and is key agenda item of policy documents of financial concerns (Zaman, Hassan, Akhter and Meraj, 2018). Essentially, corporate financial failure is an inability to maintain business operation for producing sufficient financial resources to pay regular expanses (Wolfson, 2017). The literature on corporate financial failure directs to adopt auto corrective and conditional policy moves in two ways i-e macro economically and by accounting fundamentals (Acosta-Gonzalez, Fernanzdez-Rodriguez and Ganga, 2019).

The notion of corporate financial failure is interconnected with bankruptcy and its outcomes (Jardin and Severin, 2011; Jardin, 2015; Liao and Mehdian, 2016). The literature extends perspectiveof corporate financial failure in three perspectives ie- accounting based, macro-economic by using deep belief network and hybrid DBN-SVM system (Huang and Yen, 2019). Indeed, Giriuniene, Giriunas, Morkunas & Brucaite, (2019) concluded that adoption of modern methodologies to mitigate financial failures are pivotal for financial growth at corporate level. For companies, corporate financial failure looks incalculable and in median due to rapid financial, territorial, and economic variations (Norwani, Zam and Chek, 2011). This is maximizing gap in financial market succession at company level (Almamy, Aston and Ngwa, 2016).

Although the model for corporate failure prediction is inscribing and missing for eastern countries (Geng, Bose & Chen, 2015) but the increasing trend of corporate financial failure is causing psycho-financial pressures at macro and micro avenues contextually (Wang and Wu, 2017; Ku, Fujita and Li, 2017). The maximum vulnerability of corporate failure in financial matters has been an issue in maintain corporate financial growth and wealth maximization (Rahayu, 2019). As asserted by Morris, (2018) that mitigating corporate failure using accurate accounting system and sustainable policies against macroeconomic fundamentals are effective tools to nourish corporate finances. These underlying viewpoints enable companies to manage their financial failures (Mannasoo, Maripuu and Hazak, 2018). However, such ruling pact of financial failure in financial/corporate markets has powered the researcher’s interest to investigate and provide necessary policy recommendations (Schwab, Gold and Reiner, 2019).

Internationally, financial sector is featured by defiant financial positions and low growth turnover (Wang et al, 2016). Stakeholders engaged in corporate sector are inclined towards growth paths (Waqas, Md-Rus, 2018). As asserted by Valencia et al, (2019) corporate sectors needs specified territorial and economic competencies against financial failure. By attaining such competencies stakeholders can locate corporate financial growth to manage their further notions (Akbar, Akbar, Tang and Qureshi, 2019) due to this significance of financial growth cannot be undermined. Therefore, the dire need is to understand and identify that how financial failure is predictable and how it is associated with macroeconomic and corporate accounting proponents?

Empirical investigations on corporate financial failures are discussing performance assessment (Lin and Shin, 2016) dynamism (Paul and Chakraborty, 2018) and corporate collapse (Rossouw and Styan, 2019). However, in academic literature and corporate practices the importance of corporate financial failure is increasing, it has been under researched dimension contextually. Presenting the significant importance to stated research gap by valuing importance of financial failure in local markets current study is aims to empirically assess proponents of corporate financial failure. More specifically recent research aims to test and validate antecedents of corporate financial failure in Pakistani context. Hence, this study proposes as accounting based and macro-economic indicators as key determinants of corporate financial failure.

2. Literature Review

Companies facing corporate financial failure are much focusing sustainable financial improvement for participating in international economy (Shumway, 2001). In the context of modern literature of finance and economics, much focus is on financial sustainability (Bartov,Givoly and Hayn, 2002) , financial growth (Altman, Macro and Varetto, 1994) and constraints to growth (Altman and Saunders, 1997). In distinction, Dambolena & Khoury, (1980) revealed that a sustainable financial mechanism is required to mitigate the corporate financial failure. While, and Fernandez-Rodriguez, (2019) extended the suggestions for this framework as need is to develop a contextual framework including accounting & macroeconomic specific determinants. Garcia, Marques, Sanchez and Ochoa-Dominguez, (2019) presented a framework for the corporate financial failure. And Acosta-Gonzalez

Various financial difficulties arise due to certain financial failure (Sun, Li, Huang and He, 2014). Such financial issues are usually pronounced as bankruptcy (Walsh and Cunningham, 2016) as per theoretical rationale presented by various studies in this manner. Financial distress prediction is the core process of early financial warning to manage financial affairs properly, in vice versa ultimately leading to failure (Sun et al., 2014). Academic investigation on financial failure is contributing since more than 11 decades but is unable to locate exact financial proponents causing financial failure (Fitzpatrick, 1932). Various ratios are used in predicting financial failure by using multivariate analysis including business failure prediction models and cash flows ratios (Almamy, Aston and Leonard, 2016). Financial failure is a continuous process resulting abnormality in key financial activities at corporate level.

Uncountable studies have focused on building the relationship of corporate financial failure with company and market specific determinants (Gurung and Gupta, 2019; Randika and Wijekoon, 2018; Abdullah and Said, 2018). And a wider room still exists in this abstract with macroeconomic and accounting factors (Altman, 1968). However, business cycles have unique attribution as affecting corporate positions leading to failure has a possibility to manage by macroeconomic indicators entailing systematic risk (Jabeur and Fahmi, 2018). For this several programing tools are observed as significant in identifying financial failure (Chen, 2018). Consequently, investment, money market factors, profits, non-financial asset values and interest rates are observed as significant with corporate financial failure (Agarwal and Taffler, 2007).

Kovacova et al., (2018) suggested several accounting and economic dimensions predicting corporate financial failure. Subsequent to these tow stream dimensions of financial failure (Tamara, Villegas and Andres, 2019) such two streamed models to support the corporations and stakeholders to sustain in the business line. Succeeding the said knowledge on financial failure freshet Huang & Yen, (2019) presented a multidimensional framework for the financial failure including proponents of it with machine learning and financial algorithms. This framework has been widely used in assessing financial performance of the companies (Wang and Wu, 2017; Aaron, Nainggolan and Trinugroho, 2017; Wyrobek and Kulza, 2018) that purely flashing generic aptitude of financial failure indicators.

These indicators include liquidity, profitability, indebtness, cash flow, ownership and equilibrium ratios in predicting financial failure (Gavurova, Packova, Misankova and Smrcka, 2017). While, macroeconomic variables explaining financial failures are e.g. interest rate, stock market volatility, bank arrears, land price, credit to manufacturing companies, sectorial GDP, per annum percentage of inflation stock market volatility and country risk premium (Bertrand and Parnaideau, 2017; Huang, Wang and Kochenberger, 2017). As asserted by Amankwah-Amoha et al., (2016) it is concluded that simultaneous internal and external factors have significant contribution in predicting company level financial failure. So we conclude the hypothesis as,

H1: Accounting Ratios are significantly predicting financial failure of corporations

H2: Macroeconomic indicators are significantly contributing to predict corporate financial failure

3. Methodology

The study aims to empirically assess determinants of corporate financial failure. The epistemological scope of study is positivism and study motivates pure financial determinants participating in it to control socio-culture response bias. The study is explaining the relationship of macroeconomic and accounting oriented factors participating in promoting corporate financial failure. For this our study significance is contextual and aims to evaluate Pakistani context where sample consists of 10 delisted companies of textile sector specifically with random sampling to predict corporate failure. Such companies are found de-listed as per Company Ordinance, 1957 section 176 (See Appendix 1). Similarly, ten companies are selected that are listed in Pakistan Stock Exchange (PSX) with healthy financial reports (See Appendix 2).

The random sampling is used to select the delisted and listed companies of PSX. This is used to conclude more realistic findings from the study. The data is obtained from 2010 to 2018. The sample frame consists of ten listed and ten bankrupt companies of textile sector. The data of companies is obtained from annual financial reports from SBP data base and macroeconomic data is obtained from world development indicators online database. The nature of data is secondary, for this Krusokal Wald tests, sensitivity analysis tests are used by adapting genetic algorithm methodology to explain the prediction of company’s financial failure. This methodology vitally predicted constraints of financial failure and non-failure in recent study to present modified individualistic solution for population of study (Deb, 2000). A comprehensive model is planned to assess the corporate financial failure that includes investment, money market factors, profits, non-financial asset values and interest rates, interest rate, stock market volatility, bank arrears, land price, credit to manufacturing companies, sectorial GDP, per annum percentage of inflation stock market volatility and country risk premium. The measurement proxies of the variables are given (See appendix 3 and 4).

As asserted by, Fernandez-Rodriguez, (2019) corporate financial failure is predicted and assessed as per equation (1) and (2) in Pakistani context (e.g. Textile sector) including accounting and economic indicators

$$\boldsymbol{CFF = Z\ score = c + \beta + \beta 1\ Sol + \beta 2\ Prof + \beta 3\ Act + \beta 4\ Indeb + \beta 5\ Equi + \beta 6\ Cashflow + \beta 7\ Asset\ Struc + \beta 8\ Other\ it} \quad \textbf{(1)}$$

The equation (1) includes corporate financial failure *(CFF)* to predict by incorporating proxies of solvency *(Sol)*, profitability *(Prof)*, Activity *(Act)*, Indebtedness *(Indeb)*, Equilibrium ratios *(Equi)*, cash flow ratios *(Cashflow)*, Assets structuring proponents *(AsstStruc)*, Other internal financial indicators (other) where *i* represents intersection and *t* represents sample time period. The equation (2) equates economic indicators to assess corporate financial failure as follows,

$$\boldsymbol{CFF = c + \beta + \beta 1\ IRTS + \beta 2\ IR + \beta 3\ VSM + \beta 4\ CRP + \beta 5\ GD + \beta 6\ INF + \beta 7\ UR + \beta 8\ SGDP\ it} \quad \textbf{(2)}$$

Equation (2) IS expanding economy level indicators to predict financial failure at corporate side by Interest rates term structure *(IRTS)*, Interest Rate *(IR)*, Volatility of the stock market *(VSM)*, Country risk premium *(CRP)*, Government debt *(GD),* Inflation *(INF)* and sector wise GDP *(SGDP)*.

4. Empirical Results

Table 1 *Percentile Score of Accounting Indicators - Financially Failed and Non-Failed Firms*

Years before Failure	Model	Ratios	Ratio Proxies	Financially Failed 50%	Financially Failed 75%	K-W Sig	Years before Failure	Financially Non-Failed 50%	Financially Non-Failed 75%	K-W Sig
	1	Solvency	1	17.34	22.37	0.000		-9.05	-13.45	0.142
			2	21.31	34.67	0.000		-11.45	-21.26	0.151
			3	11.76	23.09	0.000		-13.61	-7.51	0.127
			4	17.16	21.29	0.000		-17.09	-5.56	0.119
			5	17.01	27.56	0.000		-22.35	-4.32	0.135
			6	24.04	20.76	0.000		-11.22	-6.77	0.116
			7	14.76	21.84	0.000		-10.01	-4.43	0.115
			8	15.67	17.56	0.000		-11.23	-12.73	0.107
			9	16.32	26.07	0.000		-12.19	-12.55	0.213
	2	Profitability	1	22.67	34.31	0.000		-13.34	-12.57	0.321
			2	13.76	30.55	0.000		-14.45	-12.43	0.254
			3	23.18	22.78	0.000		-11.31	-11.99	0.261
			4	24.44	26.03	0.000		-14.48	-11.21	0.277
			5	17.76	28.09	0.000		-15.69	-16.67	0.184
			6	18.56	34.74	0.000		-14.33	-13.34	0.176
			7	19.56	30.71	0.000		-13.01	-10.07	0.209
			8	20.22	16.76	0.000		-12.76	-19.56	0.315
	3	Activity	1	13.13	21.59	0.118		-12.23	-3.04	0.132
			2	22.45	22.89	0.136		11.04	14.04	0.121
			3	14.79	21.56	0.127		10.75	13.23	0.173
			4	13.59	25.05	0.155		-9.14	-8.54	0.164
	4	Indebt	1	16.86	21.03	0.000		11.17	-12.4	0.115
			2	22.19	21.34	0.000		13.34	-7.59	0.134
			3	34.67	30.17	0.000		12.56	-6.65	0.128
			4	17.48	26.67	0.000		-13.79	-14.44	0.176
			5	18.78	21.77	0.000		-17.56	-18.56	0.194
			6	17.76	22.34	0.000		-14.44	-11.26	0.104
			7	23.34	23.78	0.000		-13.26	-8.54	0.274
			8	26.67	17.76	0.000		-12.56	-9.93	0.227
			9	17.08	22.31	0.000		-11.76	-18.34	0.297
			10	16.67	20.09	0.000		-14.65	-17.37	0.308
			11	5.09	21.56	0.000		14.44	13.67	0.203
			12	16.01	22.34	0.000		-11.25	10.1	0.222
	5	Equilibrium	1	17.56	21.57	0.129		-21.44	-17.67	0.346
			2	13.34	20.59	0.113		-20.54	-21.23	0.189
			3	10.17	21.67	0.117		-19.52	-12.09	0.192
			4	13.93	27.73	0.138		-21.33	-13.45	0.134
			5	16.67	24.54	0.125		-20.41	-17.07	0.127
			6	17.82	21.56	0.169		-17.78	-23.76	0.138
			7	21.83	23.18	0.154		-18.23	-24.51	0.151
	6	Cash flow	1	22.09	23.48	0.000		-14.09	-8.89	0.179
			2	17.87	22.09	0.000		-26.11	-11.01	0.235
			3	11.79	21.29	0.000		-13.23	-12.54	0.357
			4	23.45	24.67	0.000		-14.54	-23.15	0.205
	7	Asset Structure	1	19.76	22.36	0.000		-16.67	-6.75	0.213
			2	21.19	24.56	0.000		-15.51	-12.31	0.282
	8	Other Internal Variables	1	21.02	25.46	0.000		-13.44	-11.51	0.184
			2	20.76	23.74	0.000		-23.41	-26.51	0.117

**K-W is Krussokal test significance criteria selected as 10% significance criteria (Five Models)*
**Five models are developed as per five year back data to assess corporate financial failure*

As per study data we have applied Kurroskal Wald test to assess the percentile wise results of accounting and economic indicators. To assess the results in predicting the financial failure textile sector is selected where five years old data is obtained of each company since the year of company bankruptcy nomination. The operationalization revealed that all accounting indicators are significantly predicting the financial failure in textile companies of the Pakistan except activity and equilibrium. Moreover, the results of bankrupt companies are found positively significant in predicating financial failure, non-bankrupt companies are observed as insignificantly and negatively predicting corporate financial failure.

Table 2 *Percentile Score of Economic Indicators*

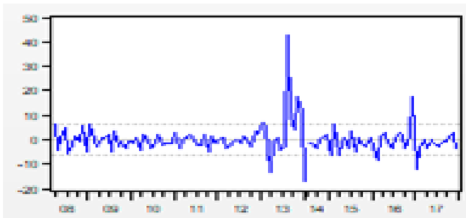
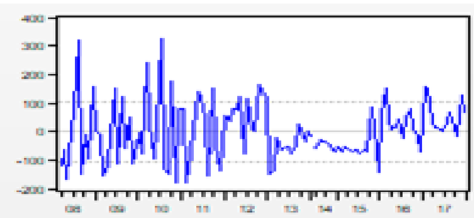
Macroeconomic variables	β	T	Significance
IRTS	0.34	6.33	0.176
IR	0.72	11.82	0.000
Volatility of the stock market	0.63	16.56	0.000
Country risk premium	0.59	9.59	0.124
Government debt	0.81	11.93	0.000
Inflation	0.74	8.86	0.000
Unemployment rate	0.68	7.76	0.326
Sector’s share of GDP	0.42	12.02	0.193

This table is significantly revealing contributing of economic indicators in predicting corporate financial failure insignificantly where IRTS 0.176, country risk premium 0.124, unemployment rate 0.326 and sector wise GDP as 0.193 ($P > 0.10$). Likewise, interest rate, stock market volatility, government debt and inflation are significantly contributing in corporate financial failure of textile sector.

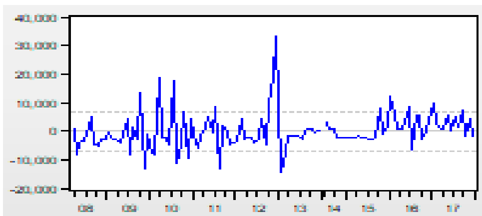
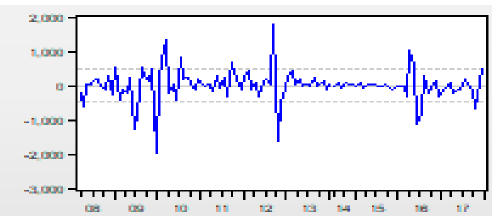
Table 3 *Extraction of Antecedents Predicting Financial Failure*

Variable	Proxies	Model 1	Model 2	Model 3	Model 4	Model 5	Total	Coefficient
Accounting Indicators	Solvency	•	•	•	•	•	5	-2.62
	Profitability	•	•	•	•	•	5	-0.074
	Activity						0	2.13
	Indebt	•	•	•	•	•	5	-1.92
	Equilibrium						0	1.14
	Asset Structure	•	•	•	•	•	5	-3.18
	Cash flow	•	•	•	•	•	5	-4.44
	Other Internal Variables	•	•	•	•	•	5	-3.02
Economic Indicators								
	IRTS						0	1.15
	IR	•	•	•	•	•	5	-2.27
	Volatility of the stock market	•	•	•	•	•	5	-3.09
	Country risk premium						0	0.064
	Government debt	•	•	•	•	•	5	-1.81
	Inflation	•	•	•	•	•	5	-3.74
	Unemployment rate						0	0.005
	Sector’s share of GDP						0	0.093

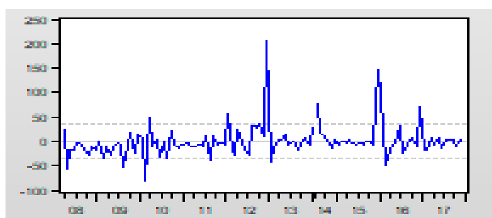
Similarly, table three is presenting significance of accounting and economic proponents contributing in financial failure where activity ratios, equilibrium ratios, country risk premium, sectorial GDP and unemployment rate are observed non-contributing in textile sector financial failure. The coefficient of contributing factors is negatively affecting financial performance of textile sector in Pakistan tabulated in above table. The coefficient results are separately measured because each antecedent has separate units to account for financial failure as whole (Altman and Edward, 1968). Moreover, following graph is presenting flows of variation among failure predicting antecedents obtained through sensitivity analysis.

Solvency Profitability

Indebt Asset Structure



Cash Flows

(Graph 1 Sensitivity Analysis)

Table 4 *Accuracy Rate of Models*

	Model 1	Model 2	Model 3	Model 4	Model 5
Rate of Accuracy	0.87	0.96	0.73	0.91	0.89

The sensitivity analysis has presented accuracy score of all 5 models (e.g. predicted on the bases of five years back data of each company for financial failure) as 0.87, 0.96, 0.73, 0.91 and 0.89 respectively. Moreover, this is sound prediction of financial failure in textile sector as greater than 0.70 a standard criteria of parallel form alpha in sensitivity analysis. Thus, the resulted Z-score of accounting indicators in recent study in Pakistan predicting corporate financial failure is as follows,

$$\boldsymbol{CFF = Z\ score = \ c + \beta + \beta 1\ Sol + \beta 2\ Prof + \beta 3\ Indeb + \ \beta 4\ Cashflow + \ \beta 5\ Asset\ Struc + \ \beta 6\ Other\ it} \quad \mathbf{(3)}$$

And the economic indicators contributing in financial failure by recent study findings are,

$$\boldsymbol{CF = \ c + +\beta 1\ IR + \beta 2\ VSM + \ \beta 3\ GD + \ \beta 4\ IN\ it} \quad \mathbf{(4)}$$

The results of the study are concluding that solvency, profitability, indebtedness, cash flows, assets structure and other accounting indicators are significantly predicting corporate financial failure. Thus, this is the modified Z-score for Pakistani bankrupt companies specifically. Moreover, Interest rate, volatility of stock market, inflation and governmental debt are resulted as strong pinching factors against textile sector betterment (i-e. leading towards financial failure). Hence, both hypothesis of study are accepted in Pakistani context that accounting and economic indicators are significantly predicting corporate financial failure in textile sector of Pakistan.

5. Conclusion

Recent study intended to assess predictive factors of corporate financial failure in Pakistani context. Simultaneous theoretical and empirical gaps motivated to investigate the study to present policy recommendations. The study is also planned to investigate sophisticatedly by using proper econometric techniques ion Pakistani Stock Exchange (PSX). We operationalized more than seven factors of Z – score whereby indebtedness, cash flows, profitability, size and profitability explained significant prediction. These accounting indicators are observed as significantly contributing in financial failure of textile sector. Moreover, economic indicators i-e interest rate, stock market volatility, inflation and government debt also contributed significantly in financial failure of textile sector in Pakistan. Conclusively, both economic and accounting indicators are observed as significant. Hence, hypothesis of study are accepted. The novelty of study included (i) observation of systematic trends in accounting and economic indicators extending textile sector financial failure (ii) bridging the contextual gap (e.g. Pakistani context) (iii) significantly confirm random walk theory by using contextual findings (iv) consistency in trends of data resulting lack of short run and long run contingent variation in data sets (v) first time presenting accounting and economic indicators contribution in financial failure of local context.

5.1. Practical Implications & Future Recommendation

1) Singular matrix problem forced to exclude several Z- score factors in recent study. To overcome dire need is to maintaine stakeholders trust in ture and practical sense.
2) To reduce financial failure in textile sector growth oriented policies are seriously required with low government debt affecting financial position of textile sector.
3) SECP and PSX should impose tight limitations to mitigate textile failure and bailout from Pakistan. To eradicate curse of textile bailout corporate democratic culture should be promoted to replace family business structure.
4) Security exchange commission of Pakistan should promote several economic adjusted business schemes to promote and rebuild business arena for textile sector in Pakistan. This is also possible by restricting earnings multiples mechanism.
5) Interestingly, to study financial failure more economic, governance and corporate culture dimensions can extend novel contribution in this subject matter.

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Appendices

Appendix (1) Bankrupt (De-listed) Corporation of Textile Sector Included in Sample

1	Mehar Dastgeer Textiles
2	Alif Textile Mills
3	Rashid Textile Mills
4	Bahawalpur Textile Mills
5	Itti Textiles Mills
6	Ayaz Textile Industry
7	Norrie Textiles
8	Awan Textiles
9	Modren Textile Company
10	Amazai Textile Mills

Appendix (2) Healthy (Listed) Corporation of Textile Sector Included in Sample

1	Colony Sarhad Textile
2	Amtex Ltd
3	Appolo Textiles
4	Artistic Demin Textile
5	Bhanero Textile
6	Khyaber Textile
7	D.M. Textiles
8	Dewan Textiles
9	Dewan Khalid Textiles
10	Fazal Textiles

Appendix (3) Measurement Proxies of Accounting Indicators

Ratio	*Sub Ratio*	*Measurement*
Solvency	General Ratio	Current Assets/Current Liability
	Immediate liquidity	Cash/Current liability
	Activity Ratio	Current assets – inventory/ Current Liability
	Shareholders liquidity Ratio	Shareholder funds/Non-Current Liability
	Shareholder funds/Invested capital %	(Shareholder funds/Shareholder funds Noncurrent liabilities)*100
	Payback capacity	(Long term debt + current liabilities) / (Sales + Amortization + Variation in provisions
	Sol 1	Current liabilities/total assets
	Sol 2	Financial debts/cash flow
	Sol 3	Cash/total liabilities
Profitability	Economic profitability (%)	Net income/total assets
	Financial profitability (%)	(Net income/shareholders' funds) * 100
	Return on capital employed (%)	EBIT/(shareholders' funds + non-current liabilities)) * 100
	Return on total assets (%)	(Earnings before income taxes/total assets) * 100
	Profit margin (%)	(Earnings before income taxes/operating revenue) * 100
	Net assets productivity	Operating revenue/(shareholders' funds + non-current liabilities)
	Interest cover	Operating income/interest paid
	Financial expenses (%)	Financial and similar expenses + variation in provisions for financial investment/sales
Activity	Net sales growth (%)	((Sales (t) - Sales (t - 1))/Sales (t - 1)) * 100
	Total assets rotation	Sales/total assets

	Fixed assets rotation	Sales/fixed assets
	Stock rotation	Operating revenue/stocks
Indebtedness	Ind1	Long term debt/total assets
	Ind2	Shareholders' funds/total liabilities
	Ind3	Long term debt/shareholders' funds
	Ind4	Long term debt/current liabilities
	Ind5	Total liabilities/total assets
	Ind6	Total liabilities/shareholders' funds
	Ind7	EBIT/financial expenses
	Ind8	Fixed assets/shareholders' funds
	Ind9	(Shareholders' funds + long term debt)/total assets
	Ind10	(Shareholders' funds + long term debt)/current liabilities
	Ind11	(Shareholders' funds + long term debt)/total liabilities
	Ind12	Cash flow/total liabilities
Equilibrium	Working capital (Th.)	Shareholders' funds + provision for risks and expenses + long-term debt-fixed and other noncurrent assets
	Working capital requirement (Th.)	[Accounts receivable + inventory + prepaid expenses] - [accounts payable + accruals]
	Equilibrium	(Shareholders' funds + other non-current liabilities + long term debt)/fixed assets
	Eq1	Working capital/total assets * 100
	Eq2	(Shareholders' funds - capital)/total assets)
	Eq3	(Shareholders' funds + long term debt)/total assets
	Eq4	Current assets/total sales
Cash flow	CF1	Cash flow/total assets
	CF2	Cash flow/total sales
	CF3	Cash flow/shareholders' funds
	CF4	Cash flow/current liabilities

Asset structure	Fixed assets weight	Fixed assets/total assets
	Current assets weight	Current assets/total assets
Other internal variables	Size	Company's total assets
	Age	Years elapsed since the creation of the company

Appendix (3) Measurement Proxies of Accounting Indicators

Macroeconomic variables	*Description*
Interest rates term structure	Spread of IRTS (long-term interest rate-short-term interest rate)
Interest rate	12 month Euribor, date: December of each year
Volatility of the stock market	Standard deviation of the IBEX-35 returns during the last 60 days of each year
Country risk premium	Country risk premium for Spain at 31 December each year
Government debt	Annual government debt
Inflation	Annual percentage change in Consumer Price Index
Unemployment rate	Annual unemployment rate
Sector's share of GDP	Sector GDP/national GDP